60459180

CONTROL DATA

CDC® CYBER CHANNEL COUPLER

FR205-A
FV720-A

GENERAL DESCRIPTION
OPERATION
INSTALLATION AND CHECKOUT
THEORY OF OPERATION
DIAGRAMS
MAINTENANCE
PARTS DATA
WIRE LISTS

HARDWARE MAINTENANCE MANUAL

REVISION RECORD

REVISION	DESCRIPTION
A (04-30-85)	Manual released.
B (06-25-85)	Manual revised; includes Field Change Order 46675. Pages 2-5, 5-2, 5-3/5-4, 5-39/5-40, 5-43/5-44, 5-49/5-50, 5-55, 5-57, 5-87, 5-117/5-118, 5-121/5-122, 5-127/5-128, 5-143, 5-147, 5-151, 5-155, 5-163, 7-24, and 7-35 are revised.
C (10-09-85)	Manual revised; includes Field Change Order 46825 and Engineering Change Orders 46822 and 46824. Pages 5-2, 5-3/5-4, 5-135/5-136, 7-4 through 7-8, 7-17, 7-25 through 7-27, 7-32, 7-36 through 7-38, 7-43, 8-3 through 8-75, 8-77, 8-79, 8-81, 8-83, and 8-84 are revised. Pages 8-87 through 8-91 are added.
D (10-11-85)	Manual revised; includes Field Change Order 46913. Pages 5-2, 5-3/5-4, 7-24, and 7-35 are revised.
E (01-22-86)	Manual revised; includes Field Change Order 47300. Pages 3-5, 5-2, 5-3/5-4, 5-31, 5-35/5-36, 5-139, 5-141, 5-143, 5-145, 5-147, 5-149, 5-151, 5-153, 5-155, 5-157, 5-159/5-160, 5-161, 7-5, 7-26, 7-31, 7-37, and 7-42 are revised.
F (02-18-86)	Manual revised; includes Field Change Order 47357. Pages 3-1, 3-7, 3-8, 5-2, 5-3/5-4, 5-53, 5-101, 5-103, 5-105, 5-109, 5-113/5-114, 5-133/5-134, 5-137, 5-169, 7-7/7-8, 7-25, 7-27, 7-31, 7-36, 7-38, and 7-42 are revised. Pages 5-100.1/5-100.2, 5-130.1/5-130.2, and 5-162.1/5-162.2 are added.
G (03-21-86)	Manual revised; includes Field Change Order 47460 and 47166. Pages 8-3 through 8-73/8-74 are revised.
H (04-04-86)	Manual revised; includes Engineering Change Order 46958. Pages 5-2, 5-3/5-4, 7-30, and 7-41 are revised.
J (04-04-86)	Manual revised; includes Field Change Order 46694. Pages 5-2, 5-3/5-4, 5-59, 5-61, 7-30, and 7-41 are revised.
K (06-26-87)	Engineering Change Order 47162; cuts in new PC layout of the maintenance and CYBER status boards.
L (06-26-87)	Engineering Change Order 47465; creates new wire listing.
M (06-26-87)	Field Change Order 47501; adds new PROM to CYBER UDI and PROM module assemblies.
N (06-26-87)	Engineering Change Order 47702; cuts in new PC layout of FIPS I/4, 4, FIPS I/F3, PROM, STREAM, and CYBER data bus I/F module assemblies eliminating hardware changes.
P (06-26-87)	Engineering Change Order 48097; changes F type IC chips and corrects logic drawing for the maintenance board.
R (06-26-87)	Engineering Change Order 48314; corrects maintenance board.
T (06-26-87)	Engineering Change Order 48384; changes 74F169 ICs to 74S169.
Publication No. 60459180	

REVISION LETTERS I, O, Q, S, X AND Z ARE NOT USED.

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St. Paul, Minnesota 55126-6198

or use Comment Sheet in the back of this manual.

REVISION RECORD

REVISION	DESCRIPTION
U (05-26-87)	Engineering Change Order 48239; updates card placement and maintenance Kit-PLs for new transfer logic and inactivates old transfer printed circuit boards.
V (05-26-87)	Engineering Change Order 48235; deletes the +5 V dc slave power supply and associated wiring from the cabinet.
W (05-26-87)	Field Change Order 48327; adds cold start ROM code capability for CYBER.
Y (05-26-87)	Engineering Change Order 48518; eliminates clitch on new stream logic module assembly.
AA (05-26-87)	Engineering Change Order 48539; eliminates a noise problem causing errors in read block ID when using F type logic flip-flops on the FIPS 4 module. Removes 2 SIPS and reverses a diode on the CYBER status module and fixes a clock output problem.
AB (05-26-87)	Engineering Change Order 48553; changes the F type TTL circuits to S type circuits on the stream module.
AC (05-26-87)	Engineering Change Order 48535; corrects miscellaneous documents including PLs, logic diagrams and spare parts.
AD (05-26-87)	Engineering Change Order 48557; adds the +5 V dc power supply slave and associated wiring.
AE (05-26-87)	Engineering Change Order 48580; adds the 7165/895 users guide to the cable installation kits, increases the length of the EPO cables and relocates a resistor.
AF (05-26-87)	Engineering Change Order 48635; changes timing on the stream module to use the -b clock instead of the +b clock.
AG (05-26-87)	Engineering Change Order 48647; replaces four 74F240 chips with four 74S240 chips.
AH (05-26-87)	Engineering Change Order 48643; replaces two 74F10 chips with 74LS10 chips.
AJ (05-26-87)	Engineering Change Order 48667; increases the length of the twisted pair wire for the oscillator on the CYBER interface channel board assembly to 63 inches.
AK (05-26-87)	Engineering Change Order 48882; corrects a timing condition when reading from memory during a deadstart from tape or disk.
AL (05-26-87)	Engineering Change Order 48888; improves maintainability and manufacturing checkout. Engineering Change Order 48908; creates new part numbers for logic. Because extensive changes are made, change bars, and dots are not used, and all pages reflect the latest revision level. This edition obsoletes all previous editions.
AM (02-23-88)	Engineering Change Order 49221; inactivates PWBs and PWAs. Also includes miscellaneous changes.
AN (05-29-88)	Engineering Change Order 49315; eliminates the process of hand mounting IC sockets for Prom chips and Engineering Change Order 49254, changes timing.

Publication No.
60459180

MANUAL TO EQUIPMENT LEVEL CORRELATION SHEET

This manual reflects the equipment configurations listed below.

EXPLANATION: Locate the equipment type and series number, as shown on the equipment FCO log, in the list below. Immediately to the right of the series number is an FCO number. If that number and all of the numbers underneath it match all of the numbers on the equipment FCO log, then this manual accurately reflects the equipment.

EQUIPMENT TYPE	SERIES	WITH FCOs	COMMENTS
FR205-A	01	-	Released
	02	46040	
	03	46164	
	04	46142	
	05	46675	
	06	46825	
	07	46795	
	08	46826	
	09	46913	
	10	47300	
	11	47357	
	12	47460	
	13	47501	
	14	48314	
	15	48235	
	16	48327	
	17	48557	
	18	48882	
	19	48888	
FV720-A	01	-	Released
	02	46040	
	03	46164	
	04	46142	
	05	46675	
	06	46825	
	07	46795	
	08	46826	
	09	46913	
	10	47300	
	11	47357	
	12	47501	
	13	48327	
	14	48882	
	15	48888	

LIST OF EFFECTIVE PAGES

New features, as well as changes, deletions, and additions to information in this manual, are indicated by bars in the margins or by a dot near the page number if the entire page is affected. A bar by the page number indicates pagination rather than content has changed.

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Back Cover	-

PREFACE

This manual provides hardware maintenance information for the CONTROL DATA® FR205-A and FV720-A CYBER Channel Coupler (called the CCC or the coupler in this manual). The FR205-A is the basic coupler and the FV720-A is an optional coupler mounted in the same cabinet. The information in this manual is organized into the following major sections:

Section 1 - General Description

Section 2 - Operation

Section 3 - Installation and Checkout

Section 4 - Theory of Operation

Section 5 - Diagrams

Section 6 - Maintenance

Section 6A - SAMS

Section 6B - Procedures

Section 7 - Parts Data

Section 8 - Wire Lists

Other manuals providing reference and site preparation information for the coupler are listed as follows. Also listed are the subsystem user's guides that contain microcode information applicable to a specific configuration of which the coupler is a part. All manuals may be ordered from:

Control Data Corporation
Literature and Distribution Services
304 North Dale Street
St. Paul, MN 55103

Control Data Publication	Publication Number
CYBER Channel Coupler FR205-A/B, FV720-A/B Hardware Reference Manual	60459170
Computer Systems Site Preparation Peripheral Data	60275300
895 Disk Storage Subsystem User's Guide	60459190
NOS 2 Installation Handbook	60459320
5870 Non-Impact Printer Subsystem User's Guide	60461360
7990 Masstor Tape Storage Subsystem Reference Manual	60462000
698 CYBER Magnetic Tape Subsystem (CMTS) User's Guide	60000009
Concurrent Maintenance Library (CML) Reference Manual	60455980

Control Data Publication	Publication Number
MSL Offline Maintenance Software Library Reference Manual	60456530
Hardware Performance Analyzer (HPA) User Reference Manual	60459460
TTL Key to Logic Symbols Customer Engineering Manual	60406000

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INTRODUCTION

The CDC® CYBER Channel Coupler (the coupler) contains the hardware necessary to connect a CDC CYBER 170/180 Computer System to an attached peripheral subsystem that meets the requirements of a Federal Information Processing Standards (FIPS) device. The coupler requires that different microcode be loaded into its memory for it to control different types of subsystem devices, for example: disk, tape, or printer subsystems. Controlware information is provided in separate subsystem user guides applicable to the type of subsystem being used. Publication numbers for the various subsystem user guides are listed in the preface of this manual.

For information on the CYBER 170/180 peripheral processor programming functions applicable to the coupler, refer to the the CYBER Channel Coupler Hardware Reference Manual also listed in the preface.

The following paragraphs provide a basic description of the hardware configuration, physical description, functional description, and equipment specifications of the coupler.

HARDWARE CONFIGURATION

The coupler connects to a peripheral processor (PP) channel of a CYBER 170/180 Computer System and a FIPS-compatible disk, tape, or printer subsystem. The coupler consists of a data bus, processor, random-access memory (RAM), programmable read-only memory (PROM), CYBER channel interface, FIPS device interface, FIPS power control circuit, and transfer logic. These elements are shown in block diagram form in figure 1-1 and described in the following paragraphs.

DATA BUS

The data bus interconnects the various components (processor, CYBER channel interface, FIPS device interface, and both the RAM and PROM memories) of the coupler. Use of the data bus is divided equally between the processor, CYBER channel interface, and the FIPS device interface.

PROCESSOR

The processor is an internally programmed, 16-bit device that decodes function commands from the PP and issues instructions that allow the functions to be performed. The processor consists of two major sections; a control section and an arithmetic section. The control section processes the function commands and sequences the various instructions. The arithmetic section performs all related arithmetic operations.

RANDOM-ACCESS MEMORY

RAM contains 16 384 words of memory having a maximum read access time of 85 nanoseconds (ns). Each word is 16 bits long. The addresses available for use are 0000_{16} through $3FFF_{16}$. The microcode program is loaded into the RAM from the PP for subsequent use by the processor.

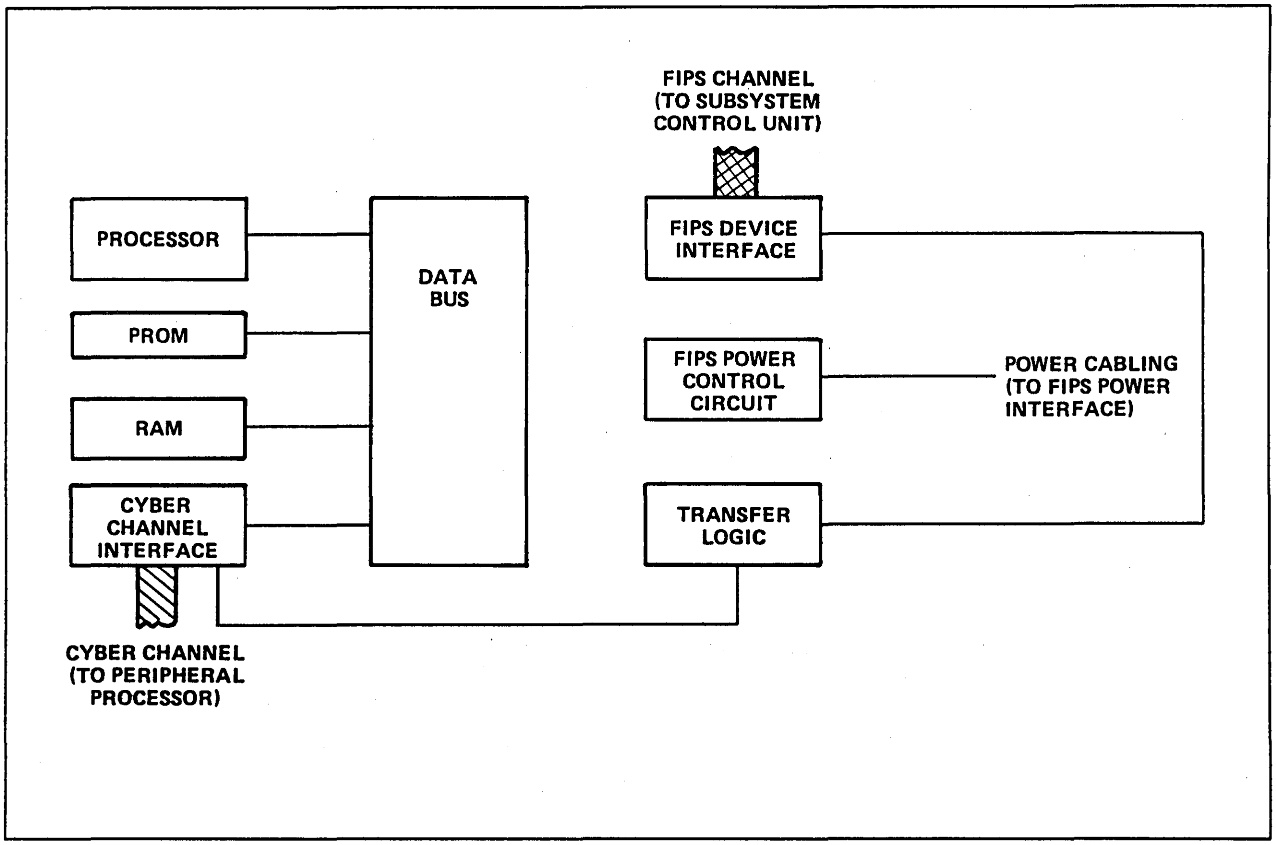

FIPS CHANNEL (TO SUBSYSTEM CONTROL UNIT)
PROCESSOR
PROM
RAM
CYBER CHANNEL INTERFACE
DATA BUS
FIPS DEVICE INTERFACE
FIPS POWER CONTROL CIRCUIT
POWER CABLING (TO FIPS POWER INTERFACE)
TRANSFER LOGIC
CYBER CHANNEL (TO PERIPHERAL PROCESSOR)

Figure 1-1. Coupler Block Diagram

PROGRAMMABLE READ-ONLY MEMORY

The PROM contains 4096 words. Each word is 16 bits long. The addresses available for use are 8000_{16} through $8FFF_{16}$. Firmware consisting of autoload functions and internal diagnostics is permanently coded in the PROM.

CYBER CHANNEL INTERFACE

The CYBER channel interface links the CYBER 170/180 PP channel to the processor and memory of the coupler. This PP channel is connected to the coupler via two 19-pin coaxial cables. All functions received from the PP (except the X5XX and X7XX diagnostic functions or functions that contain a channel parity error) are routed to the processor. The processor decodes the function and directs the CYBER channel interface to respond to the function. No response is sent to the PP if a parity error is detected.

After sending an inactive signal to the PP channel in response to a function, the CYBER channel interface waits for the processor to inform it as to the type of write or read operation that will follow (if any).

The CYBER channel interface performs six different functions under the direction of the processor, and seven diagnostic functions without processor direction. Refer to the CYBER Channel Coupler Hardware Reference Manual for detailed information on these functions.

FIPS DEVICE INTERFACE

The FIPS device interface contains the receivers, transmitters, and control logic to drive the attached peripheral device. It also provides code translation and block ID generation for tape control units.

The FIPS device interface does not use any interrupts. Therefore, no interrupt logic is connected and all logic associated with interrupts is disabled where possible.

FIPS POWER CONTROL CIRCUIT

The FIPS power control circuit controls the power sequencing of the attached peripheral devices by applying and removing power in sequential steps. This stepping of power (on or off) decreases the overall system power requirements and power surge noise generation. Two FIPS power control switches are provided on the power control panel to power two separate equipment chains. Each switch controls the power sequence to its respective peripheral device in accordance with the FIPS Channel Level Power Control Interface standard.

TRANSFER LOGIC

The transfer logic provides the necessary hardware to transfer data from the CYBER channel interface through memory to the FIPS device interface. This is accomplished through use of buffer registers. During the transfer, data is written into a 512-byte buffer by one interface and read from that buffer by the other interface.

PHYSICAL DESCRIPTION

Figure 1-2 shows the location of the major components of the coupler. These are briefly described in the following paragraphs.

CABINET

The coupler is housed in a single-wide trimline cabinet. Doors and removable panels provide access for component maintenance. A cooling blower in the base of the cabinet draws room air through a filter, circulates it around the power supplies and logic modules, and forces the air out exhaust ducts at the top of the cabinet.

The cabinet for the basic FR205-A coupler can accommodate an additional coupler as an option. The optional coupler is equipment number FV720-A and consists of logic cards only. The cabinet is prewired to accept the optional coupler.

POWER SUPPLIES

Most power supply components are located near the base of the cabinet. The coupler contains a -5 V and two +5 V dc power supplies. The power supplies operate from 120/208-V, 400-Hz, 3-phase power. A vertical bus bar carries the +5 V to logic chassis and the -5 V is routed directly to the logic chassis from a terminal board.

The blower operates from 120-V, 50/60-Hz, 1-phase power. The blower contains an airflow sensor to shut down the 400-Hz power in case of blower failure or excessive high ambient temperatures.

LOGIC CHASSIS

The logic chassis contains a fiberglass backpanel. Vertical rows of pins protrude from the back of the backpanel, pass through the backpanel, and attach to connectors on the front of the backpanel. The logic modules slide into card guides at the front of the logic chassis, and edge connectors on the logic module insert into the backpanel connectors. A wire wrapping technique is used to interconnect the backpanel pins.

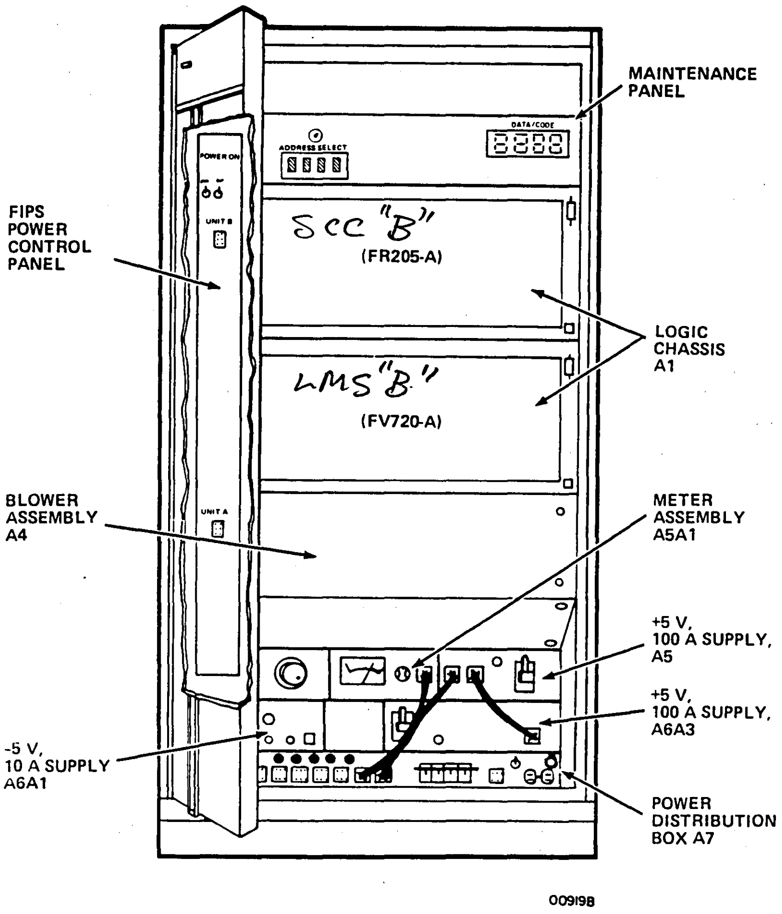


Figure 1-2. Coupler Component Locations

Logic Modules

The coupler logic is contained on 70-pak printed circuit logic modules. Up to 70 integrated circuits (IC) are mounted on each logic module in a 5 by 14 IC matrix.

Two 90-pin connectors are located on the rear edge of the logic module. The top 90-pin connector has pin designations of P1A01 through P1A45 (from top to bottom) on one side of the module and P1B01 through P1B45 on the other side. The bottom 90-pin connector has pins that are arranged in the same manner, but are designated as P2A01 through P2A45 and P2B01 through P2B45.

Test points are located on the front edge of the module. The test points are designated 01 through 51 from top to bottom on the module.

Logic Types

The coupler logic modules use transistor-transistor logic (TTL) ICs. The TTL circuits are packaged in 14-pin, 16-pin, or 20-pin dual in-line ICs. The TTL logic levels are +2.0 to +3.3 V for a high (logic 1), and from +0.2 to +0.8 V for a low (logic 0).

Signal Connections

Signals between logic modules are transmitted via the wire-wrap interconnections on the backpanel of the logic chassis. Signal connections from the FIPS device interface connectors use twisted-pair wires that are wire-wrapped to the backpanel pins. Signal connections from the CYBER channel interface connectors use twisted-pair wires that insert into plastic block connectors that fit over the backpanel pins.

MAINTENANCE PANEL

A maintenance panel is provided to read the memory locations of either coupler that may be installed in the cabinet. A thumbwheel on the panel is used to specify the desired memory address, and the contents of that address are displayed in a four-digit alphanumeric display.

FIPS POWER CONTROL PANEL

The FIPS power control panel contains two power switches and connectors that control application of power to two separate peripheral device chains. Power is applied in a specific control sequence as directed by applicable Federal Interface Processing Standards.

FUNCTIONAL DESCRIPTION

The CYBER channel coupler is driven by a CYBER 170/180 series PP. Each coupler can be accessed by only one PP channel. All communication between the PP and the coupler is initiated by function codes from the PP. All function codes are 12 bits long. The upper three bits identify the equipment controller connected to the coupler. The coupler microcode converts the PP functions into commands for controlling the attached subsystem devices and also converts subsystem status conditions to general and detailed status for use by the operating system. The functions have a PP timeout of approximately 1 second (s) to avoid hanging the channel in a full condition should a hardware logic failure occur. The coupler replies to all legal function codes described in the applicable subsystem user's manual.

EQUIPMENT SPECIFICATIONS

Equipment specifications for the coupler are as follows.

POWER REQUIREMENTS

120 Vac, 60 Hz, single phase, at 9 A/phase, 1.1 kVA or 220 Vac, 50 Hz, single phase, at 5 A/phase; and 120/208 Vac, 400 Hz, 3 phase, at 3.2 A/phase, 1.4 kVA.

ENVIRONMENTAL CONDITIONS

Temperature

Operating: 15 °C to 32 °C (59 °F to 89 °F)

Nonoperating: -40 °C to 60 °C (-40 °F to 140 °F)

Relative Humidity

Operating: 20 to 80%

Nonoperating: 5 to 95%

PHYSICAL CHARACTERISTICS

Height: 1676 mm (66 in)

Width: 737 mm (29 in)

Depth: 635 mm (25 in)

Weight: 159 kg (350 lb)

I/O CABLE INFORMATION

From	To	Quantity	Cable P/N	Length
Coupler	FIPS Device	3	774750XX†	61 m (200 ft) max
Coupler	PP Channel	2	19191600	19.8 m (65 ft)

---

†These cables are shielded and have a quick disconnect terminal fastened to the shield at each end. Refer to section 3, Installation and Checkout, for a tabulation of various cable lengths.

INTRODUCTION

This section provides information on the controls and indicators of the CYBER Channel Coupler (coupler) and their related operating procedures. For similar information on the various subsystem peripheral devices that may be attached to the coupler, refer to the applicable Control Data publication for that device.

CONTROLS AND INDICATORS

The coupler provides several controls and indicators for normal operation and for maintenance checks and adjustments. These are located on the front panel of the the coupler and also on internal logic modules.

PANEL-MOUNTED CONTROLS AND INDICATORS

The panel-mounted controls and indicators used to apply/remove coupler power and to perform voltage checks and adjustments are shown in figure 2-1 and described in the following paragraphs.

POWER-ON Indicator

This indicator lights when the dc power supplies in the coupler are operating.

50/60-HZ POWER DISCONNECT Switch

This switch located on the power distribution panel applies 50/60-Hz input power to the coupler blower motor when placed in the ON position, and removes power from the blower motor when placed in the OFF position.

400-HZ POWER DISCONNECT Switch/Circuit Breaker

This switch/circuit breaker located on the power distribution panel applies 400-Hz input power to the coupler power supplies when placed in the ON position, and removes this power when placed in the OFF position. The integral circuit breaker provides overload protection to the +5 V and -5 V power supplies.

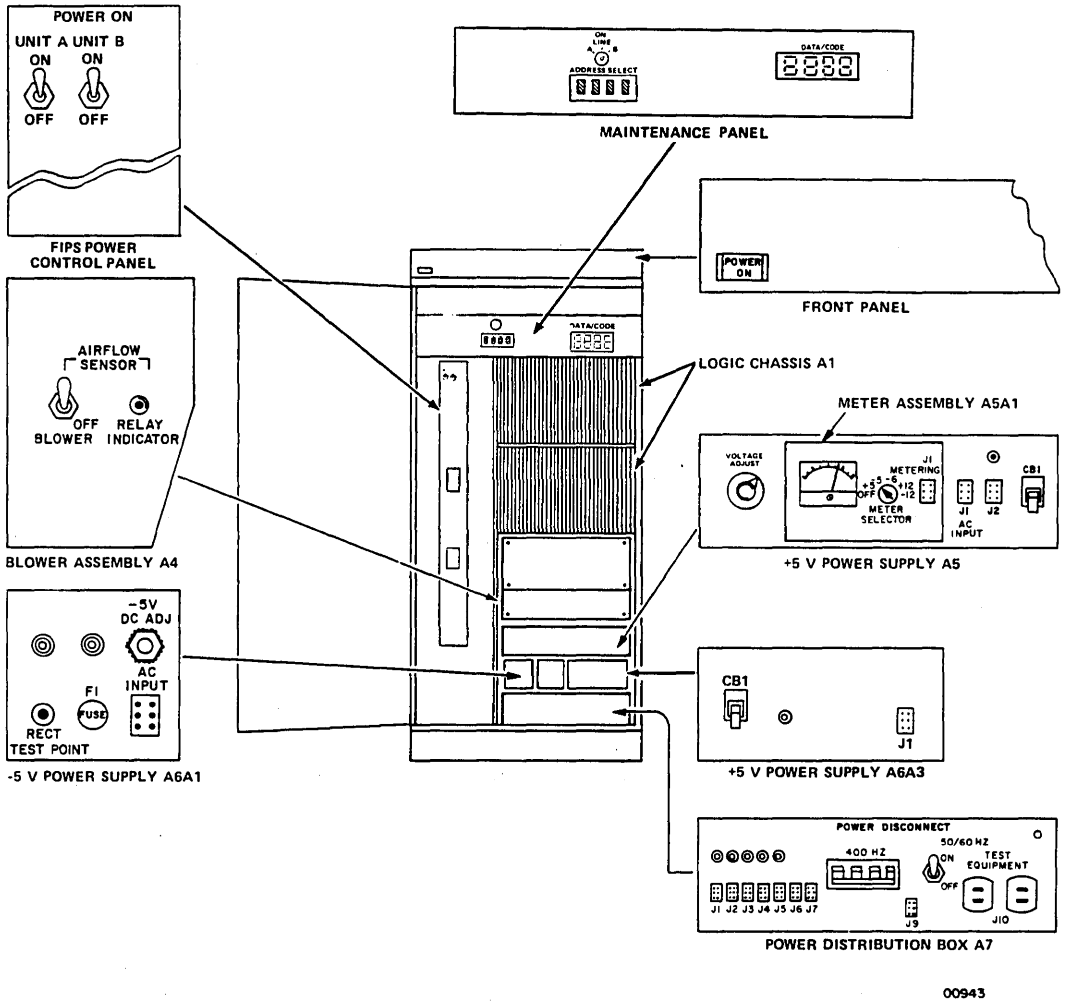


Figure 2-1. Front Panel Control and Indicator Locations

Circuit Breaker CB1 (Location A6A3)

This circuit breaker protects the +5 V power supply at location A6A3 from overload.

VOLTAGE ADJUST Control (Location A5)

The VOLTAGE ADJUST control is used for maintenance purposes to adjust the output voltage of the +5 V power supply at location A5.

Circuit Breaker CB1 (Location A5)

This circuit breaker protects the +5 V power supply at location A5 from overload.

Percent Meter (Location A5A1)

The percent meter at location A5A1 indicates a percentage difference of the nominal input voltage for that input. The METER SELECTOR switch determines which dc voltage is being monitored.

Meter Selector Switch (Location A5A1)

This switch selects which dc voltage is to be monitored by the percent meter. Only the +5 V and -5 V positions are used.

-5 V DC ADJ Control (Location A6A1)

This control is used for maintenance purposes to adjust the output voltage of the -5 V power supply at location A6A1.

Fuse F1 (Location A6A1)

This fuse provides overload protection for the -5 V power supply at location A6A1.

AIRFLOW SENSOR/BLOWER OFF Switch (Location A4)

This switch tests the operation of the airflow sensor when held in the BLOWER OFF position. This removes 50/60-Hz power from the blower.

AIRFLOW SENSOR RELAY INDICATOR (Location A4)

The airflow sensor relay indicator indicates that the high temperature switch in the airflow sensor has opened and deenergized the relays supplying 400-Hz power.

A, ON-LINE, B Switch (Maintenance Panel)

This switch selects which coupler to read memory locations from for maintenance purposes. In the A position, the FR205 is selected. In the B position, the FV720 is selected. In the ON-LINE position, the maintenance panel functions as a memory mapped display shared by either coupler. That is, either coupler can write to the display. However, the FR205 coupler has priority over the FV720.

ADDRESS SELECT Switches (Maintenance Panel)

The ADDRESS SELECT switches specify which memory address is to be read from the coupler selected by the A, ON-LINE, B switch. The contents of the address are displayed in the DATA/CODE display on the maintenance panel.

DATA/CODE Display (Maintenance Panel)

The DATA/CODE display is a four-digit, alphanumeric display that shows the contents of the selected memory address. The content is displayed in hexadecimal notation.

POWER-ON UNIT A and B Switches

These switches, located on the power control panel of the coupler, are used to apply power in a sequentially stepped fashion to two separate equipment chains that may be connected to the subsystem. The power sequence circuits regulate the initial subsystem electrical load required by the attached subsystem devices during the power application.

LOGIC MODULE A05 SWITCHES AND INDICATORS

Logic module A05 contains a master clear pushbutton switch (SW2), LED indicators 1 through 6, and microswitches SW1-1 through SW1-6. Their functions are as follows.

Master Clear Pushbutton Switch (SW2)

This switch clears the coupler and starts execution of the internal diagnostics. Note that an autoload function or a diagnostic function initiated from the PP also causes execution of the internal diagnostics.

LED Indicators 1 through 6

These LED indicators are designated 1 through 6 from top to bottom of logic module A05. They provide the following indications:

LED 1	Channel function parity error.
LED 2	This LED lights and then goes out when the CYBER channel interface and processor interaction diagnostic completes a successful check of the various interactions between this interface and the processor. This LED remains lit if the interaction diagnostic checks fail.
LED 3	Memory parity error detected by the CYBER channel interface.
LED 4	Deadman timeout.
LED 5	Processor parity error.
LED 6	This LED lights and then goes out when the internal diagnostic completes a successful check of the CYBER channel interface. This LED remains lit if the interface fails the check.

Switches SW1-1 through SW1-6

These microswitches are used for the following. Note that a switch in the OFF position indicates a set (logical 1) input to the coupler logic.

SW1-1	Enables odd parity checking of all CYBER channel data and functions when placed in the OFF position. Disables parity checking when in the ON position.
SW1-2 through SW1-4	Defines the equipment types connected to the coupler. Present switch settings for existing equipment types are as follows. All other switch position combinations are undefined.

SW1-2	SW1-3	SW1-4	Equipment Type
OFF	OFF	OFF	Disk (3330/3350)
OFF	OFF	ON	Tape (STC 3800/4600)
OFF	ON	OFF	Disk (895)
OFF	ON	ON	NIP Printer (5870)
ON	OFF	OFF	MASSTOR (7990)
ON	OFF	ON	TAPE (698)

SW1-5	Enables the coupler to loop on its internal diagnostic and never reach its idle routine when placed in the ON position. This is used for maintenance purposes only. Looping does not occur when switch is in the OFF position.
SW1-6	Not used.

LOGIC MODULE A09 INDICATORS

This module contains two LED indicators. The upper LED lights to indicate that the processor is running. The lower LED lights when a processor memory parity error occurs.

LOGIC MODULE A13 INDICATOR

This module contains one LED indicator. The LED lights and then goes out when the processor diagnostic completes a successful check of the processor. It remains lit if the processor fails the diagnostic.

LOGIC MODULE A17 INDICATORS

This module contains two LED indicators. The upper LED lights and then goes out when the FIPS device interface diagnostic completes a successful check of the interface. It remains lit if the interface fails the diagnostic.

The lower LED indicates that a memory parity error has been detected by the FIPS device interface.

LOGIC MODULE A18 INDICATORS

This module contains two LED indicators. The upper LED lights and then goes out when the FIPS device interface diagnostic completes a successful check of the interface. It remains lit if the interface fails the diagnostic.

The lower LED is not used.

LOGIC MODULE A21 SWITCHES AND INDICATORS

This module is the maintenance panel logic board. It contains three LED indicators, a toggle switch, and a pushbutton switch. The toggle switch is used to enable or disable odd parity checking (enabled when down, disabled when up). The top LED on the PC board indicates a parity error when lit. If the FV720 writes to the alphanumeric DATA/CODE display, the middle LED lights. If the FR205 writes to the DATA/CODE display, the bottom LED lights. During an internal diagnostic error, the LED of the last coupler to write into the DATA/CODE display remains lit.

OPERATING PROCEDURES

The following paragraphs provide general operating procedures applicable to the coupler.

POWER APPLICATION

Power application to the coupler is controlled by the 50/60-HZ and 400-HZ POWER DISCONNECT switches located on the power distribution panel at the front of the coupler. Power application to the attached subsystem devices is controlled by the POWER ON UNIT A and UNIT B switches located on the power control panel of the coupler. During subsystem installation, the customer engineer performs the cable routing and switch settings required for power sequencing. Thereafter, the operator normally controls application of power to the subsystem from the power control panel of the coupler.

MICROCODE AUTOLOADING

The appropriate microcode, used to control the attached peripheral devices, must be autoloaded into the coupler RAM before complete subsystem operation can occur. The following functions reside permanently in the coupler processor ROM to enable autoloading of the microcode.

0414_8	Autoload coupler microcode from PP
$06uu_8$	Autoload coupler microcode from disk

These functions are described in detail in the following paragraphs. Note that the prescribed autoload procedure depends upon site operating procedures, the operating system being used, the computer system configuration, and whether or not the computer system is running. Refer to the appropriate operating system handbook for Control Data recommended procedures (for example, for NOS, refer to the NOS 2 Installation Handbook listed in the preface).

Autoload Coupler Microcode From PP (0414_8)

This function initiates a microcode autoload from the PP to the coupler. During execution, the CYBER channel interface decodes the 0414_8 function, lights four LEDs located on internal PC boards, stops the coupler processor, and causes the FIPS device interface to go to an idle loop. The CYBER channel interface then executes its UDI diagnostic. If this diagnostic runs successfully, the CYBER channel interface turns off its LED (LED 6 on module A05) and starts the processor executing firmware microcode at PROM address 8000_{16}. The first code to execute is an instruction test. If the instruction test runs OK, the processor turns off its LED (on module A13) and then executes a processor/CYBER channel interface interaction test. If the processor/CYBER channel interface interaction test executes without error, a third LED is turned off (LED 2 on module A05). Following this, the processor instructs the FIPS device interface to execute its UDI diagnostic and turn off its LED if successful (upper LED on module A18). If all the preceding diagnostics execute without error, a reply is generated for the autoload function. The lower 8 bits of each consecutive 12-bit microcode word are then transferred from PP memory to alternate upper and lower 8-bit byte positions in coupler RAM beginning at location 0030_{16}. This method uses two 12-bit PP memory words to load each 16-bit coupler RAM word. The coupler remains in autoload mode until the PP disconnects the channel.

A partial autoload of four words or less can be performed to recover from channel timeout errors. Program execution is returned to the idle loop following a partial autoload.

During full autoload, the coupler firmware does a memory test after the eighth word is received from the channel. If the test is successful, the firmware completes the autoload. After the PP disconnects the channel, the coupler firmware calculates a checksum from the microcode data loaded into the coupler RAM. If there is a memory test error or a checksum error, the coupler processor stops and the channel is inactivated by the deadman timer. If there are no errors, the coupler processor and FIPS interface interaction tests are executed. These tests are part of the downloaded microcode. If the interaction tests fail, either the equipment switches are set wrong, the microcode number in binary is wrong, or general status is set to 5XXX, where XXX is an octal error code. Refer to the appropriate subsystem user's guide for a listing of applicable error codes. If there are no errors, a release is issued to all devices connected to the coupler, the general status is set to zero, and the coupler processor goes to an idle loop to wait for additional functions from the PP.

Autoload Coupler Microcode From Disk ($06uu_8$)

NOTE

The microcode must have previously been written on the disk in full track mode (1:1 interlace).

The autoload coupler microcode from disk function ($06uu_8$) causes the coupler to execute the same diagnostics as in a full autoload microcode from PP function (0414_8). If the diagnostics execute without error, the processor firmware checks the coupler hardware switches to determine which device to load from. If switches SW1-2, SW1-3, and SW1-4 (located on the A05 module of the coupler) are OFF, the disk subsystem is selected and the device number specified in the function code is positioned to the factory map cylinder. When the device is on-cylinder, data is read from the disk into coupler RAM.

After the coupler RAM is loaded with microcode data, the coupler firmware calculates a checksum and compares it with the correct value. If it doesn't compare, then either a function parity error has occurred, the microcode number is wrong, or the coupler couldn't load from the device. For these cases, an autoload function reply is not returned to the PP. If the coupler RAM is successfully loaded, an autoload function reply is returned to the PP, the disk device is released, and a jump is made to the coupler ROM idle loop.

MICROCODE INITIALIZATION/DISK PACK INITIALIZATION

Refer to the applicable subsystem user's guide listed in the preface of this manual for the microcode initialization/disk pack initialization procedures that apply to the attached peripheral devices.

INSTALLATION AND CHECKOUT

This section provides information necessary to install and checkout the CYBER Channel Coupler (coupler). The information is presented under the following major headings:

- Site Preparation Information
- Crating/Uncrating
- Installation Procedure
- Initial Start-Up Procedure
- CYBER Channel Clock Tuning Verification Procedure
- FV720-A Option Installation Procedure

SITE PREPARATION INFORMATION

Information that applies to the coupler is found in the Site Preparation Peripheral Data Manual (refer to the preface for publication number).

CRATING/UNCRATING

Refer to procedure 8:504:00 in the Customer Engineering Operating Manual when necessary to crate the coupler for shipment. This procedure provides the latest information to aid in obtaining packaging materials and instructions for crating.

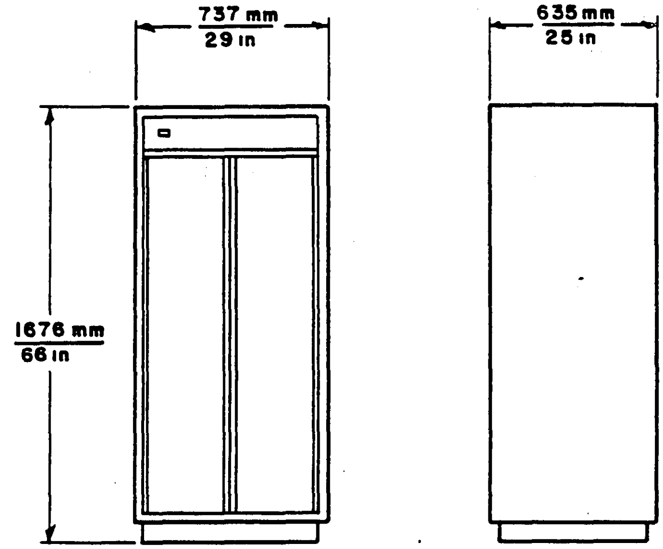
No special procedures are required when uncrating the coupler.

INSTALLATION PROCEDURE

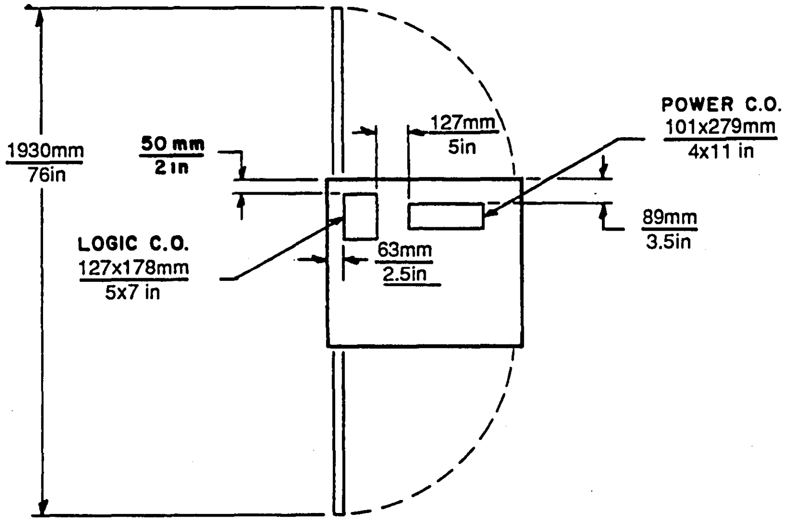
The following paragraphs provide information on space considerations, input power connections, signal cable connections, and hardware unique identifier wiring to be used when installing the coupler.

SPACE CONSIDERATION

The location of the coupler must allow enough room to open the front and rear doors to their maximum position for operating and maintenance purposes. Refer to figure 3-1 for a floor plan layout of the coupler.



FRONT SIDE



PLAN

Figure 3-1. Coupler Floor Plan Layout

INPUT POWER CONNECTIONS

Refer to figure 3-2 and perform the following steps to connect input ac power cables to the coupler:

1. Verify that site ac input power circuit breakers feeding the coupler are in OFF position. Also check that 400-HZ and 50/60-HZ POWER DISCONNECT switches on power distribution box A7 of coupler are in OFF position.

2. Remove six mounting screws and lockwashers from rear cover of power distribution box A7 and remove cover.

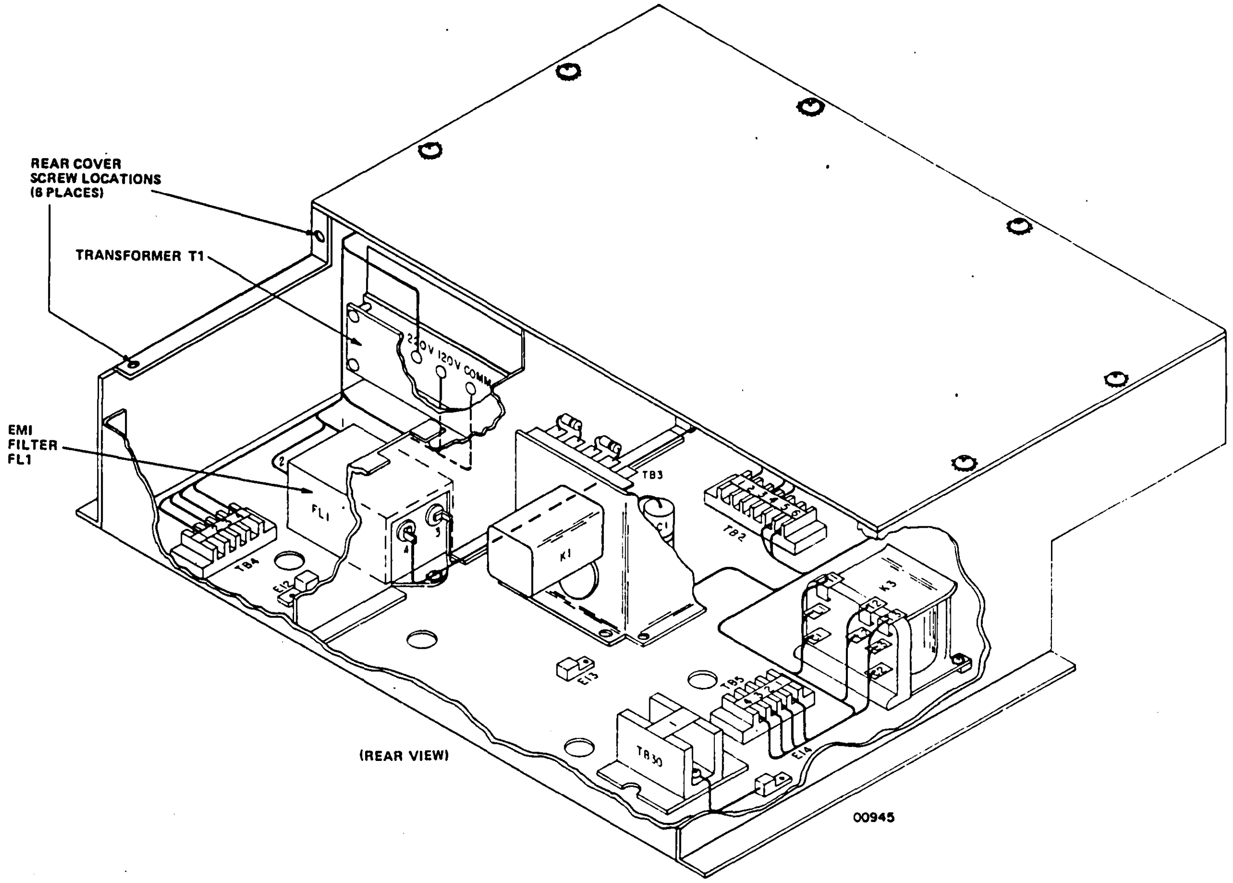


Figure 3-2. Power Distribution Box Component Locations (Assembly A7)

3. Connect a ground strap from the computer system grid ground to A7TB30.

4. Connect a single-phase power cable to power distribution box A7 terminals per the following as applicable. Note that the customer is responsible for providing power cables.

120-V, 50/60-Hz Power Cable	A7 Terminal
Neutral (white)	TB4-1
Phase 1 (black)	TB4-2
Safety ground (green)	E12

220/230/240/250-V 50/60-Hz Power Cable	A7 Terminal
Neutral (white)	TB4-3
Phase 1 (black)	TB4-4
Safety ground (green)	E12

5. For 220- through 250-V units only, connect wire from A7S1-8 to appropriate 220, 230, 240, or 250-V terminal of A7T1.

6. Connect a 120/208-V, 400-Hz, 3-phase power cable to power distribution box A7 terminals as follows:

120/208-V, 400-Hz Power Cable	A7 Terminal
Neutral (white)	TB5-1
Phase 1 (black)	TB5-2
Phase 2 (red)	TB5-3
Phase 3 (orange)	TB5-4
Safety ground (green)	E13

7. Replace rear cover on power distribution box.

8. Connect plug ends of power cables to appropriate site power outlets.

I/O AND EPO CABLE INSTALLATION

Refer to figure 3-3 for the location of the coupler I/O and EPO cable connectors and install cables per the following steps. Note that the coupler-to-FIPS device BUS and TAG and EPO cables must be either foil-shielded or braid-shielded with a quick-disconnect terminal fastened to the shield at each end. CDC part numbers for various lengths of acceptable shielded cables are as follows:

Length	I/O Cable Foil Shield	I/O Cable Braid Shield	EPO Cable Braid Shield
6.1 m (20 ft)	77475035	77475043	72920803
9.2 m (30 ft)	77475037	77475045	72920805
12.2 m (40 ft)	77475039	77475047	72920807
24.5 m (80 ft)	77475079	77475055	72920815
30.5 m (100 ft)	77475083	77475059	72920819
45.7 m (150 ft)	None	None	72920824
61 m (200 ft)	None	None	72920829

1. Connect two I/O cables (CDC 19191600) between FR205-A coupler INPUT and OUPUT connectors and PP.

2. Connect two I/O cables (CDC 774750XX) between FR205-A coupler CHANNEL A BUS and TAG connectors and external FIPS device. (Dark gray connectors to FR205-A and light gray connectors to external FIPS device.) Be sure to connect quick-disconnect terminals from cable shields to spade lugs mounted next to I/O connectors.

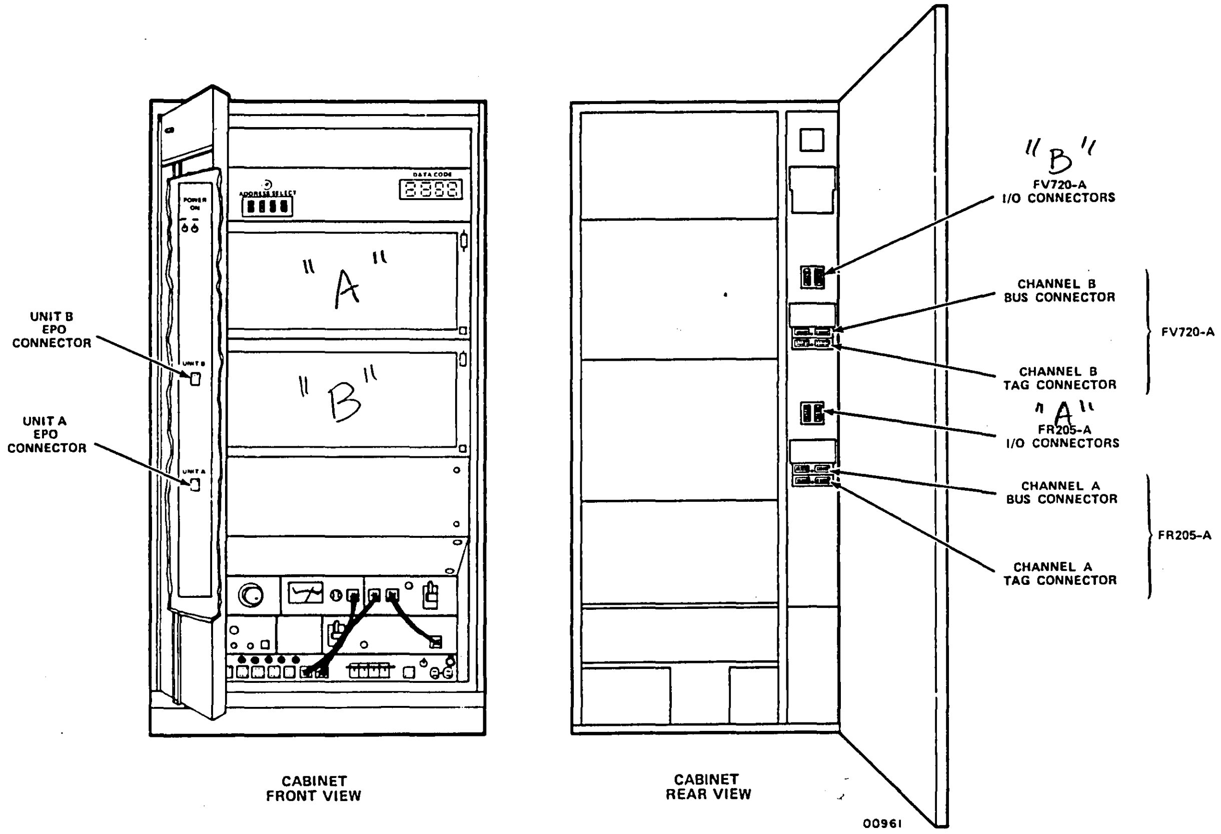


Figure 3-3. Coupler I/O and EPO Cable Connector Locations

3. Install two terminator assemblies: CDC 75268900 at BUS connector, and CDC 94390700 at TAG connector of last external FIPS device.

4. Connect EPO cable (CDC 729208XX) between UNIT A connector of coupler and EPO connector of external FIPS device.

HARDWARE UNIQUE IDENTIFIER WIRING

The hardware performance analyzer (HPA) requires that each coupler have a hardware unique identifier (HUI). The HUI consists of 8 bits that form two hexadecimal characters. The site manager must select the hexadecimal code, being certain that each number selected is unique at the site.

Wire the HUI as follows:

1. Select the number.

2. Locate the following pins on the coupler backpanel at chassis location A05.

Pin	Bit Position
P1B21	2^7
P1A20	2^6
P1B19	2^5
P1A18	2^4
P1A21	2^3
P1B26	2^2
A1A19	2^1
A1B18	2^0

3. Remove any wires attached to these pins.

4. Ground pins as necessary by attaching a wire to the selected pin and to a pin on row C or D of the backpanel. Grounded pin is the equivalent of a logical one; open pin is a zero. For example, to assign an HUI of 17_{16}, ground pins P1A18, P1B26, P1A19, and P1B18.

INITIAL START-UP PROCEDURE

Perform the following steps to initially start up the coupler following installation. Refer to section 2 for a figure showing the location of the switches and voltage adjust controls.

1. Turn VOLTAGE ADJUST control on +5 V power supply and -5 V DC ADJ control on -5 V power supply fully clockwise, and then back off each control 1/4 turn counterclockwise.

2. Turn POWER DISCONNECT 50/60 HZ switch to ON position. Blower should operate.

3. Turn POWER DISCONNECT 400 HZ circuit breaker to ON position. POWER ON indicator on front panel should light.

4. Set METER SELECTOR switch on +5 V power supply to +5 V position. Turn VOLTAGE ADJUST control until percent meter indicates 0 percent.

5. Set METER SELECTOR switch to -5 V position. Turn -5 V DC ADJ control until percent meter indicates 0 percent.

6. Place A, ON-LINE, B selector switch on coupler maintenance panel to ON-LINE position.

7. Press Master Clear pushbutton on logic module A05. Coupler executes its internal diagnostic and displays test results in DATA/CODE display on maintenance panel.

NOTE

A hexadecimal code indicating successful test completion or a test error is displayed in the DATA/CODE display. Code 8800_{16} indicates successful test completion. (Only if no LEDs remain lit on PC boards. Observe LED indicators on logic modules A05, A13, and A18 to verify successful test operation.) Refer to section 2 for LED indicator descriptions, and refer to section 6 for internal diagnostic test descriptions. Use SAM 3 in section 6A to troubleshoot any internal diagnostic errors.

8. Run coupler down-line diagnostic tests from the PP. Refer to section 6 for a description of down-line diagnostic tests and for information on how to execute them using either MALET or DEMOT. Refer to appropriate SAM in section 6A to troubleshoot any down-line diagnostic errors.

9. Load applicable subsystem operating microcode into coupler RAM. Refer to section 2 for autoload information.

CYBER CHANNEL CLOCK TUNING VERIFICATION PROCEDURE

Clock tuning is performed at the factory prior to shipment and should not be performed in the field. This procedure is provided only to verify that the tuning is correct. If a clock tuning problem exists, return the module to the factory for replacement. Note that this verification procedure applies to both the A01 module contained in the FR205-A coupler and the B01 module contained in the FV720-A coupler.

1. Turn coupler power off (400-HZ POWER DISCONNECT) switch on power distribution box A7 to OFF position.

2. Connect CYBER channel I/O cables if not already installed.

3. Place logic module A01 of FR205 (or B01 of FV720) coupler on card extender.

4. Turn coupler power on (400-HZ POWER DISCONNECT) switch on power distribution box A7 to ON position.

5. Verify accuracy of 10-MHz clock, oscilloscope, and probes per the following:

   a. Sync and look at TP34 using channel A of oscilloscope. There should be 100± 2 ns from leading edge of one pulse to leading edge of next pulse.

   b. Compare channel B with channel A, they should be the same.

6. Check 40-MHz clock circuit as follows:
    1. Ground TP34 (or 4717-13 on board assembly 53584147, or 4017-13 on board assembly 23140103).
    2. Sync and look at TP36. The leading edge of pulses should be 90± 2 ns apart.
    3. Remove ground installed in step 6a.
    4. Pulses at TP36 should be 100± 2 ns apart.
7. Check T75D pulse relationship with T75 pulse as follows:
    1. Sync and look at TP36 (T75) using channel A of oscilloscope.
    2. Connect channel B to TP30 (T75D). The leading edge of pulse at TP30 should lag leading edge of pulse at TP36 by 15± 2 ns.
8. Turn coupler power off (400-HZ POWER DISCONNECT switch on power distribution box A7 to OFF position) and reinstall logic module in chassis.
9. Turn coupler power on (400-HZ POWER DISCONNECT switch on power distribution box A7 to ON position) and reload subsystem microcode in coupler. Refer to section 2 for autoload information if needed.

FV720-A OPTION INSTALLATION PROCEDURE

Perform the following steps to install the FV720-A coupler option:

1. Turn coupler power off by placing 400-HZ POWER DISCONNECT switch to OFF position.
2. Refer to chassis map in section 5 for correct card placement, and install logic modules in logic chassis.
3. Connect two I/O cables (CDC 19191600) between FV720-A coupler INPUT and OUPUT connectors and PP. Refer to figure 3-3 for coupler I/O connector locations.
4. Connect two I/O cables (CDC 774750XX) between FV720-A coupler CHANNEL B BUS and TAG connectors (figure 3-3) and external FIPS device. Be sure to connect quick-disconnect terminals from cable shields to spade lugs mounted next to I/O connectors.
5. Connect EPO cable (CDC 729208XX) between UNIT B connector of coupler (figure 3-3) and EPO connector of external FIPS device.
6. Install two terminator assemblies: CDC 75268900 at BUS connector and CDC 94390700 at TAG connector of last FIPS device.
7. Attach FV720-A Option ID tag to front panel of coupler just to right of FR205-A ID tag.
8. Attach FV720-A FCO log to inside of rear cabinet door next to FR205-A FCO log.
9. Assign an 8-bit hardware unique identifier (HUI) to the FV720-A coupler by wiring the appropriate backpanel pins at chassis location B05. Refer to the Hardware Unique Identifier Wiring procedure for the FR205-A coupler described previously for wiring information.
10. Apply power to coupler by placing 400-HZ POWER DISCONNECT switch to ON position.

11. Place A, ON-LINE, B selector switch on coupler maintenance panel to ON-LINE position.

12. Press Master Clear pushbutton on logic module B05 of FV720-A coupler. Coupler executes its internal diagnostic and displays test results in DATA/CODE display on maintenance panel.

NOTE

> A hexadecimal code indicating successful test completion or a test error is displayed in the DATA/CODE display. Code 8800_{16} indicates successful test completion. (Only if no LEDs remain lit on PC boards. Observe LED indicators on logic modules A05, A13, and A18 to verify successful test operation.) Refer to section 2 for LED indicator descriptions, and refer to section 6 for internal diagnostic test descriptions. Use SAM 3 in section 6A to troubleshoot any internal diagnostic errors.

13. Run coupler down-line diagnostic tests from the PP. Refer to section 6 for a description of down-line diagnostic tests and for information on how to execute them using either MALET or DEMOT. Refer to appropriate SAM in section 6A to troubleshoot any down-line diagnostic errors.

14. Load applicable subsystem operating microcode into coupler RAM. Refer to section 2 for autoload information.

THEORY OF OPERATION 4

Refer to the following for information on CYBER Channel Coupler (coupler) theory of operation:

Logic circuit descriptions

Refer to the text pages in the diagrams section of this manual.

Subsystem microcode functional description

Refer to the applicable subsystem user's guide as listed in the preface.

Coupler microcode functional description

Refer to the CYBER Channel Coupler Hardware Reference Manual listed in the preface.

This section contains a chassis map, block diagrams, logic diagrams, a power distribution diagram, and a CCC power interface diagram for the CYBER channel coupler.

The diagrams for the optional coupler (FV720) are the same as those for the basic coupler (FR205) diagrams except for the location of the logic boards. The basic coupler is contained in logic row A, and the optional coupler is contained in logic row B. Refer to the chassis map for specific card locations.

Refer also to the TTL Key to Logic Symbols Customer Engineering Manual listed in the preface for a description of the symbology used in the logic diagrams. Conventions used to annotate the logic diagrams are shown in figure 5-1.

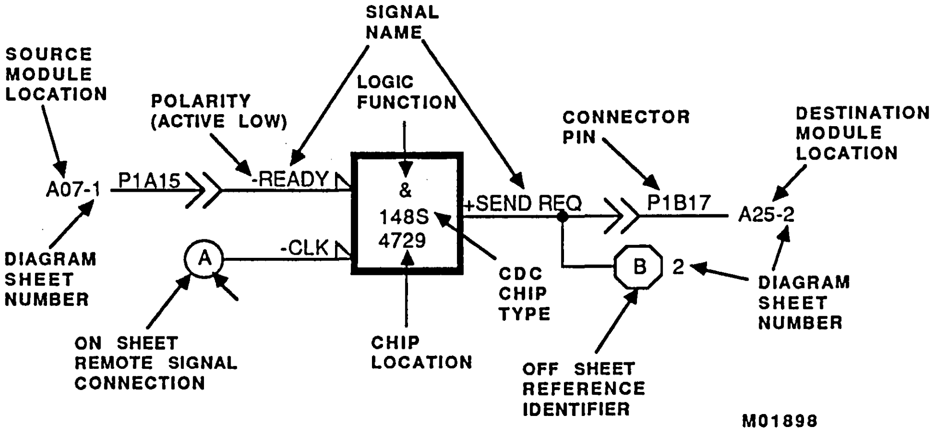


Figure 5-1. Logic Diagram Conventions

NOTE

In some cases more than one logic set is provided for a given chassis location. This is done to reflect the different module assemblies (PWA's) that are currently in use in the field.

Table 5-1. Module History Interchangeability Chart (Sheet 1 of 2)

Module Description			Module History									
Chassis Location	Name	/////// ///////	Original Assembly	Transitional Assemblies								
01	CYBER Channel I/F	PWA PWB ECO/FCO	22724526 53030935 --	53584147 53030935 CA46416	53584147 53030935 CA46416							
		PWA PWB ECO/FCO	-- -- --	23140103 23140104 CA46958	23140103 23140104 CA48667	23140103 23140104 CA48667	23140103 23140104 CA48908					
02	CYBER Data Bus Interface	PWA PWB ECO/FCO	24614691 53030939 --	53584148 53030939 CA46416	53590792 53030939 CA47300	53590792 53030939 CA48908	53590792E 53030939 CA49221					
		PWA PWB ECO/FCO	-- -- --	-- -- --	22179490 22179491 CA47702							
04	CYBER 2K UDI	PWA PWB ECO/FCO	21935420 52803444 --	67185208 52803444 CA45598	67184857 52803444 CA46483	53615387 52803444 CA46795	22938786 52803444 CA46822	53590825 52803444 CA47501	22136077 52803444 CA48882	22136077B 52803444 CA49221		
		PWA PWB ECO/FCO	-- -- --	-- -- --	23140164 67046086 CA46607	53615388 67046086 CA46795	22938787 67046086 CA46822	53590826 67046086 CA47501	22136078 67046086 CA48882	22136078B 67046086 CA49221		
		PWA PWB ECO/FCO	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	22110341 67046086 CA48097	22136079 67046086 CA48882	10284351 67046086 CA49315		
05	CYBER Status Clocks	PWA PWB ECO/FCO	53984796 53030937 CA43740	22194398 53030937 CA47357	22194398B 53030937 CA48239	22194398C 53030937 CA48908	22194398D 53030937 CA49221					
		PWA PWB ECO/FCO	-- -- --	53812422 53812423 CA47162	53812422 53812423 CA47162							
		PWA PWB ECO/FCO	-- -- --	22110340 53812423 CA48097	22114772 53812423 CA48539							
08	Proc. ALU	PWA PWB ECO/FCO	53479827 52803442 CA44622	53595819A 52803442 CA46694	53595819B 52803442 CA48251	53595819C 52803442 CA48536	53595819D 52803442 CA48908					
09	Proc. Control	PWA PWB ECO/FCO	52803441A 52803440 --	52803441B 52803440 CA43466	52803441C 52803440 CA46694	52803441D 52803440 CA48908						
		PWA PWB ECO/FCO	-- -- --	-- -- --	-- -- --	10292489 52803440 CA49315						
10	RAM Memory	PWA PWB ECO/FCO	52681115C 22012832 CA43466	52681115D 22012832 CA48908								
13	PROM	PWA PWB ECO/FCO	67184802A 67045721 CA45598	67184802B 67045721 CA46550	67184802C 67045721 CA46700	24641282 67045721 CA46037	22724697 67045721 CA46092	53367240 67045721 CA46142	22183281 67045721 CA47501	22183281 67045721 CA47501	22118208 67045721 CA48327	22118208B 67045721 CA49221
		PWA PWF ECO/PCO	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	53590869 53590870 CA47702	22118209 53590870 CA48384	53590727 53590870 CA48327	
14	Transfer Logic	PWA PWB ECO/FCO	23106106 23106107 --	24641311 23106107 CA46040	53595831 23106107 CA47357	53595831 23106107 CA47357						
		PWA PWB ECO/FCO	-- -- --	-- -- --	22179698 22127691 CA48239	22110278 22127691 CA48647						

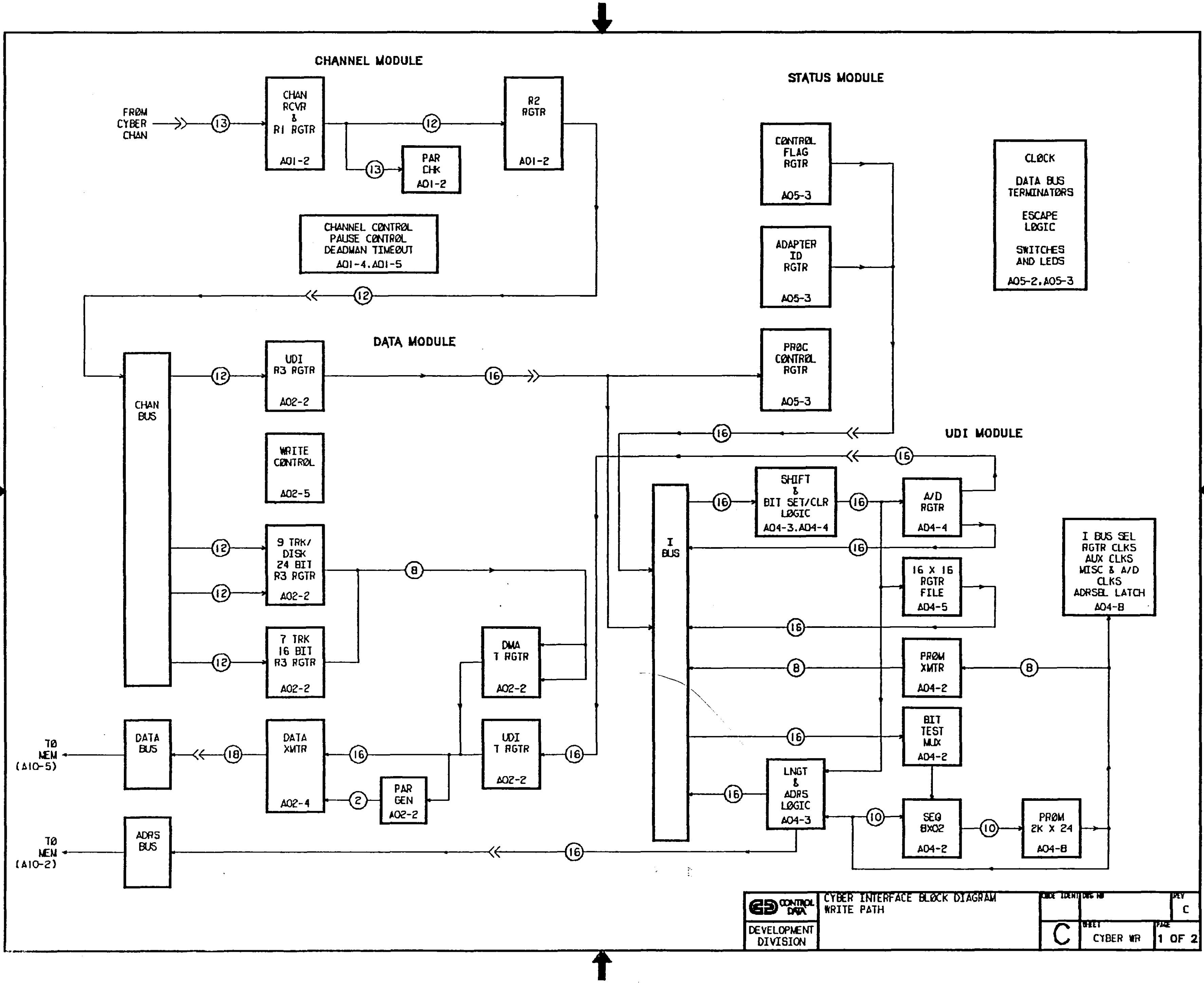
Table 5-1. Module History Interchangeability Chart (Sheet 2 of 2)

Module Description			Module History									
Chassis Location	Name	/////// ///////	Original Assembly	Transitional Assemblies								
15	FIPS 2K UDI	PWA	18988207	67070500	23142107	22937360	67327640	22136087	22136087B			
		PWB	52803444	52803444	52803444	52803444	52803444	52803444	52803444			
		ECO/FCO	--	CA45598	CA46483	CA46675	CA46913	CA48888	CA49221			
		PWA	--	--	23140165	22937361	67327641	22136088	22136088B			
		PWB	--	--	67046086	67046086	67046086	67046086	67046086			
		ECO/FCO	--	--	CA46607	CA46675	CA46913	CA48888	CA49221			
		PWA	--	--	--	--	22110342	22136089	10284352			
		PWB	--	--	--	--	67046086	67046086	67046086			
		ECO/FCO	--	--	--	--	CA48097	CA48888	CA49513			
16	Stream Logic	PWA	23105177	24641312	22938794	53595830	53595830	53595830	53595830	10285714		
		PWB	23105178	23105178	23105178	23105178	23105178	23105178	23105178	23105178		
		ECO/FCO	--	CA46040	CA46824	CA47357	CA47357	CA47357	CA47357	CA49254		
		PWA	--	--	--	22179487	22120940	22120959	22110274	53595830		
		PWB	--	--	--	22179488	22179488	22179488	22179488	23105178		
		ECO/FCO	--	--	--	CA47702	CA48518	CA48553	CA48635	CA49254		
17,18	FIPS I/F III	PWA	24613187	67184804A	67184804B	22724648	24641335	53590793	53590793B			
		PWB	--	24670928	24670928	24670928	24670928	24670928	24670928			
		ECO/FCO	--	CA45598	CA46553	CA46037	CA46164	CA47300	CA49221			
		PWA	--	--	--	--	23140954	53590794	53590794B			
		PWB	--	--	--	--	23140955	23140955	23140955			
		ECO/FCO	--	--	--	--	CA46106	CA47300	CA49221			
		PWA	--	--	--	--	--	53590866				
		PWB	--	--	--	--	--	53590867				
		ECO/FCO	--	--	--	--	--	CA47702				
19	FIPS I/F IV	PWA	24613189	67184805A	67184805B	24641250	24641336	22194396	22194396	22194396	22194396	22194396B
		PWB	--	24670929	24670929	24670929	24670929	24670929	24670929	24670929	24670929	24670929
		ECO/FCO	--	CA45598	CA46551	CA46037	CA46164	CA47357	CA47357	CA47357	CA47357	CA49221
		PWA	--	--	--	--	23140957	22194397	22194397	22194397	22194397	22194397B
		PWB	--	--	--	--	23140958	23140958	23140958	23140958	23140958	23140958
		ECO/FCO	--	--	--	--	CA46106	CA47357	CA47357	CA47357	CA47357	CA49221
		PWA	--	--	--	--	--	53590844	22120958A	22120958B	22120958C	10283690
		PWB	--	--	--	--	--	53590845	53590845	53590845	53590845	53590845
		ECO/FCO	--	--	--	--	--	CA47702	CA48539	CA48580	CA48621	CA49088
A21	Maint. Board	PWA	53542482	67184806A	67184806B	67184806C	67184806C	67184806C	67184806C			
		PWB	--	24670930	24670930	24670930	24670930	24670930	24670930			
		ECO/FCO	--	CA45598	CA46552	CA48097	CA48097	CA48097	CA49221			
		PWA	--	--	53812428	53812428	22106391	22110276				
		PWB	--	--	53812429	53812429	53812429	53812429				
		ECO/FCO	--	--	CA47162	CA47162	CA48314	CA48643				

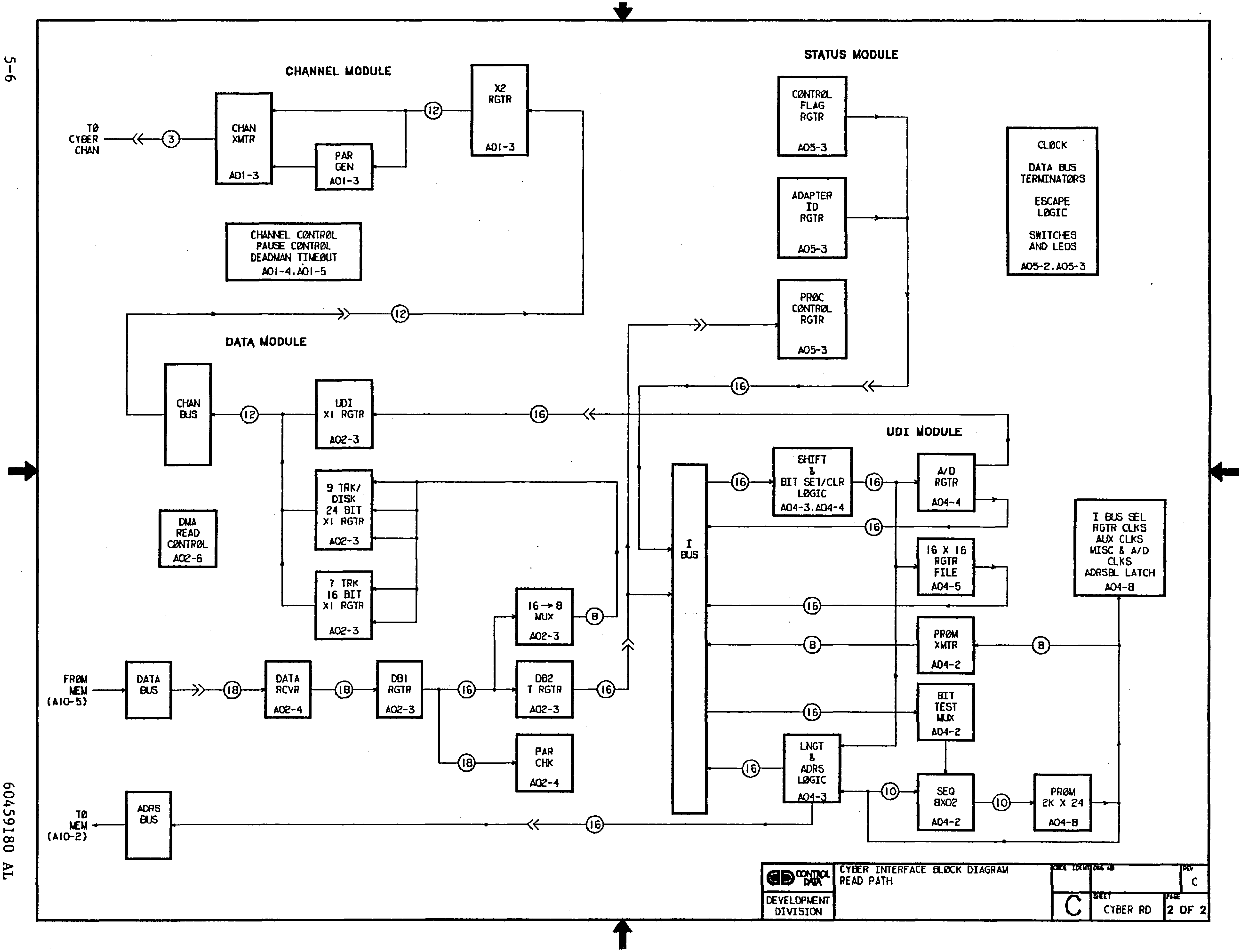
	FR205 BASIC COUPLER A	FV720 OPTIONAL COUPLER B	
27			27
26			26
25			25
24			24
23			23
22			22
21	MAINTENANCE BOARD 22110276		21
20			20
19	FIPS INTERFACE IV 10283690	FIPS INTERFACE IV 10283690	19
18	FIPS INTERFACE III 53590866	FIPS INTERFACE III 53590866	18
17	FIPS INTERFACE III 53590866	FIPS INTERFACE III 53590866	17
16	STREAM BOARD 22110274	STREAM BOARD 22110274	16
15	FIPS 2K UDI 10284352	FIPS 2K UDI 10284352	15
14	TRANSFER LOGIC 22110278	TRANSFER LOGIC 22110278	14
13	PROM BOARD 53590727	PROM BOARD 53590727	13
12			12
11			11
10	RAM MEMORY 52681115	RAM MEMORY 52681115	10
09	PROCESSOR CONTROL 10292489	PROCESSOR CONTROL 10292489	09
08	PROCESSOR ALU 53595819	PROCESSOR ALU 53595819	08
07			07
06			06
05	CYBER STATUS CLOCKS 22114772	CYBER STATUS CLOCKS 22114772	05
04	CYBER 2K UDI 10284351	CYBER 2K UDI 10284351	04
03			03
02	CYBER DATA BUS INTERFACE 22179490	CYBER DATA BUS INTERFACE 22179490	02
01	CYBER INTERFACE CHANNEL 23140103	CYBER INTERFACE CHANNEL 23140103	01
	A	B	

TOP OF UNIT

CCC CHASSIS MAP
FR205-A/FV720-A
CONTROL DATA
DEVELOPMENT DIVISION
SIZE C
SHEET CHAS MAP



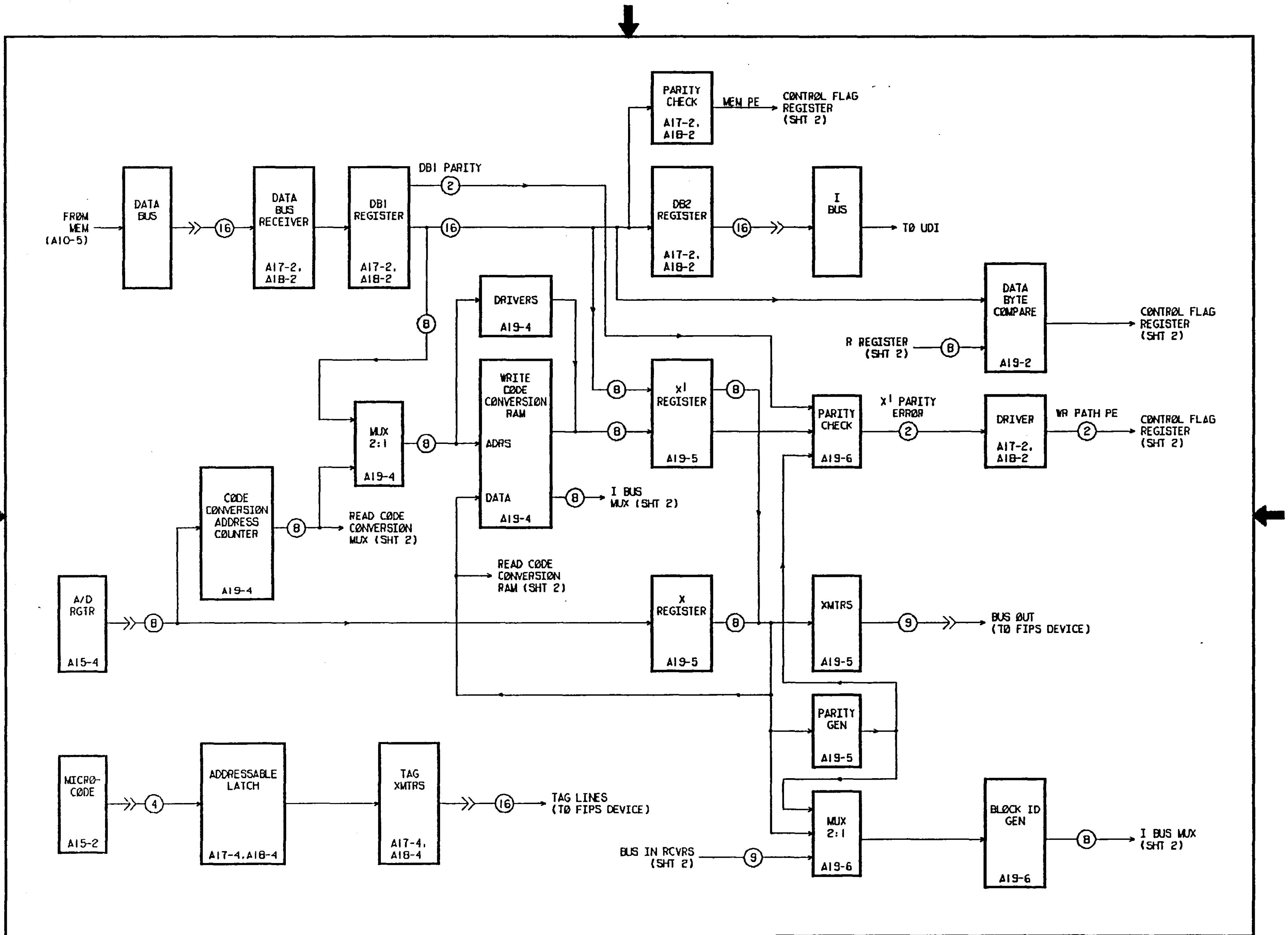
CONTROL DATA
DEVELOPMENT DIVISION
CYBER INTERFACE BLOCK DIAGRAM
WRITE PATH
REV C
C
CYBER WR
1 OF 2



CONTROL DATA
DEVELOPMENT DIVISION

CYBER INTERFACE BLOCK DIAGRAM
READ PATH

CODE IDENT | DWG NO | REV C
C | SHEET CYBER RD | PAGE 2 OF 2



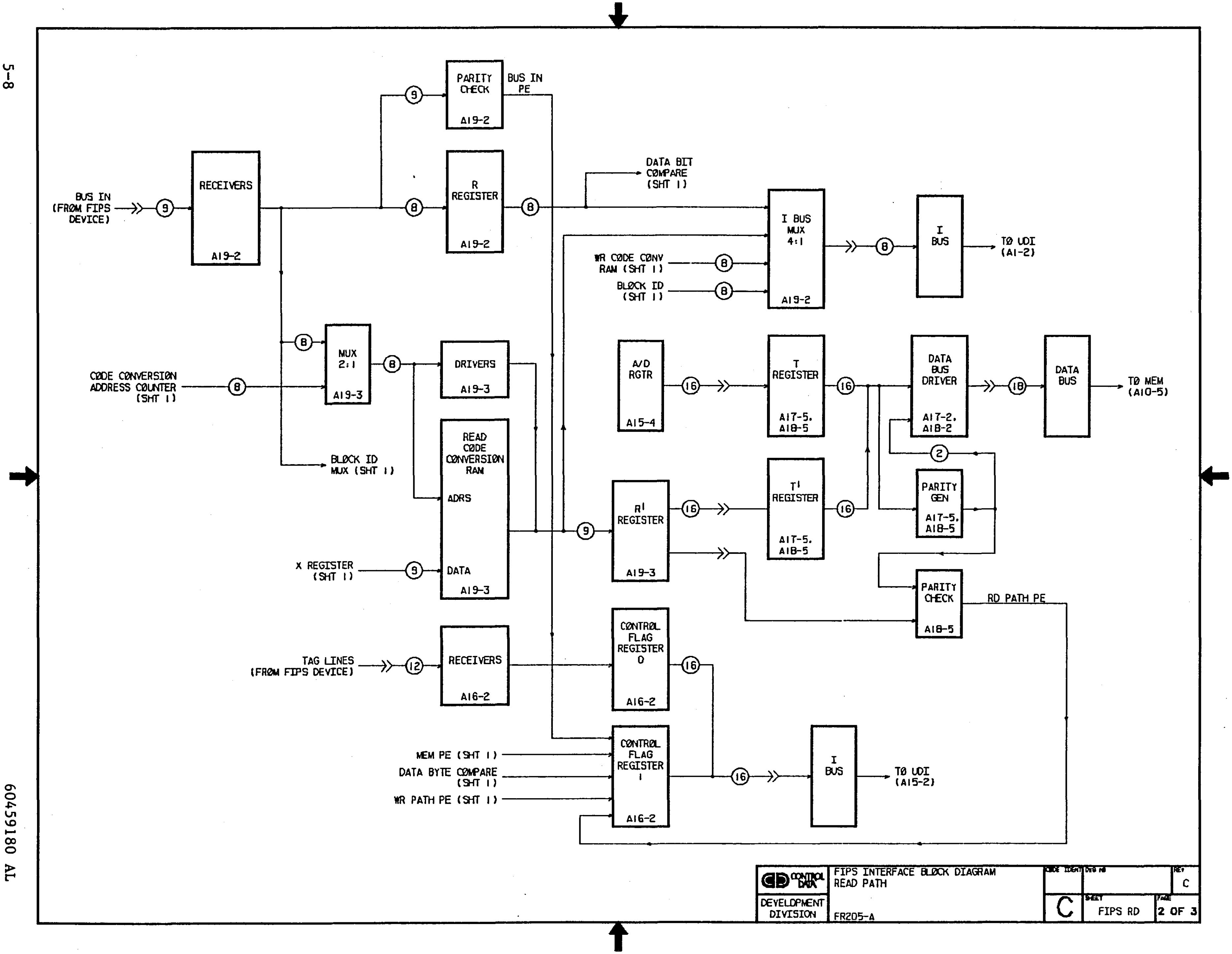
CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE BLOCK DIAGRAM
WRITE PATH

CODE IDENT	DWG NO	REV
		C

SIZE	SHEET	PAGE
C	FIPS WR	1 OF 3



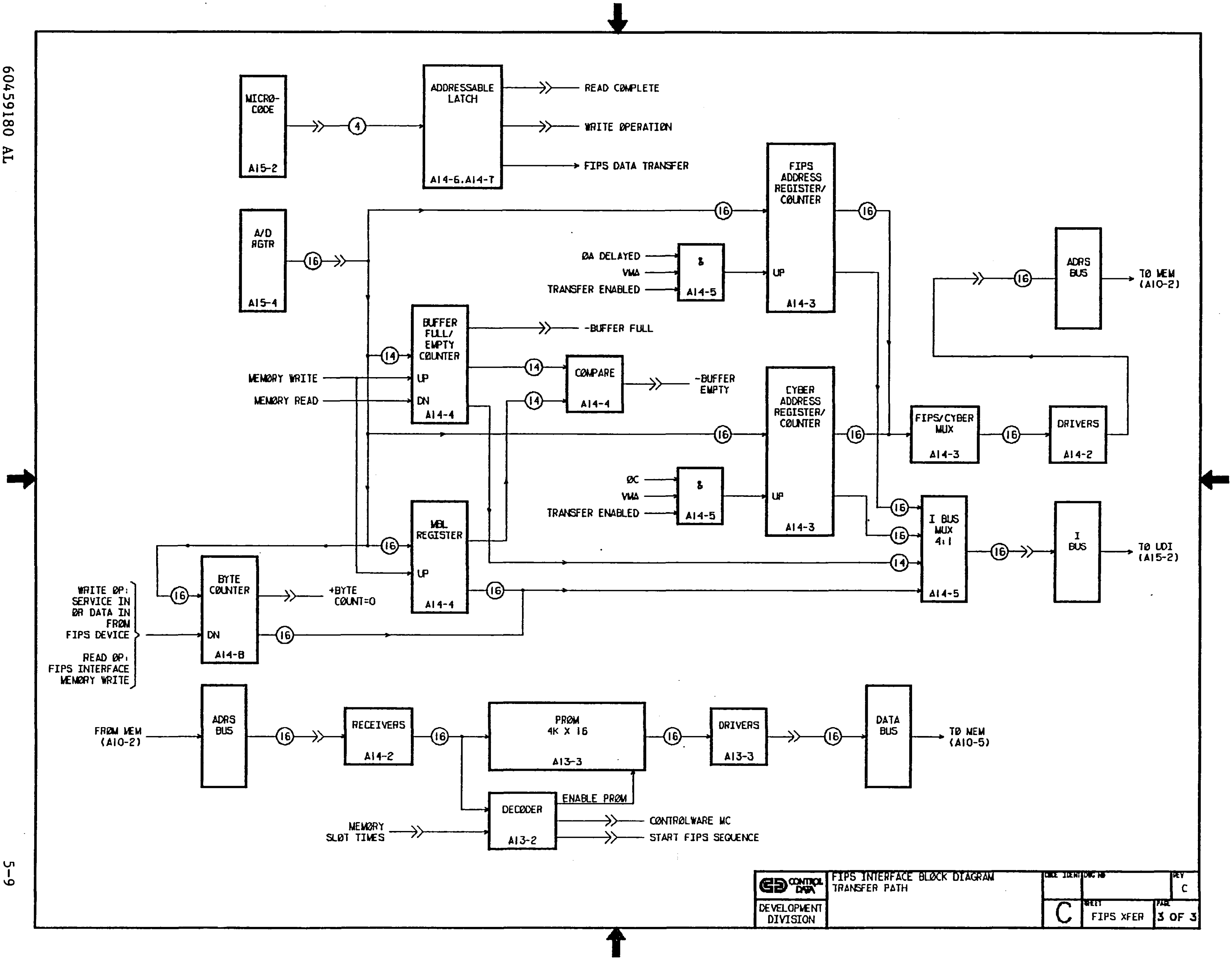
CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE BLOCK DIAGRAM
READ PATH

FR205-A

CODE IDENT	DWG NO	REV
C	SHEET FIPS RD	PAGE 2 OF 3
		C



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE BLOCK DIAGRAM
TRANSFER PATH

CAGE IDENT | DWG NO | REV C

C | SHEET FIPS XFER | PAGE 3 OF 3

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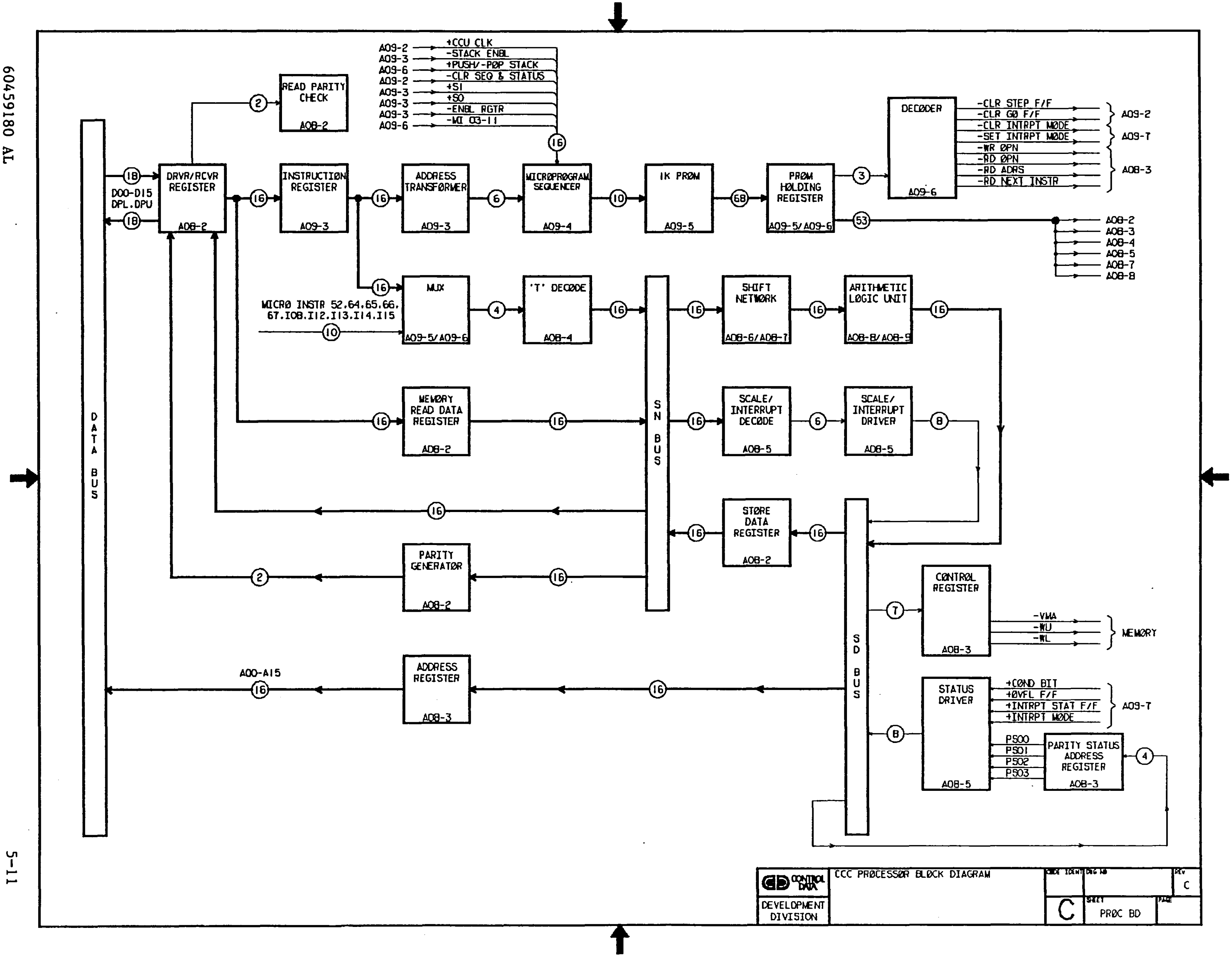

CCC PROCESSOR BLOCK DIAGRAM

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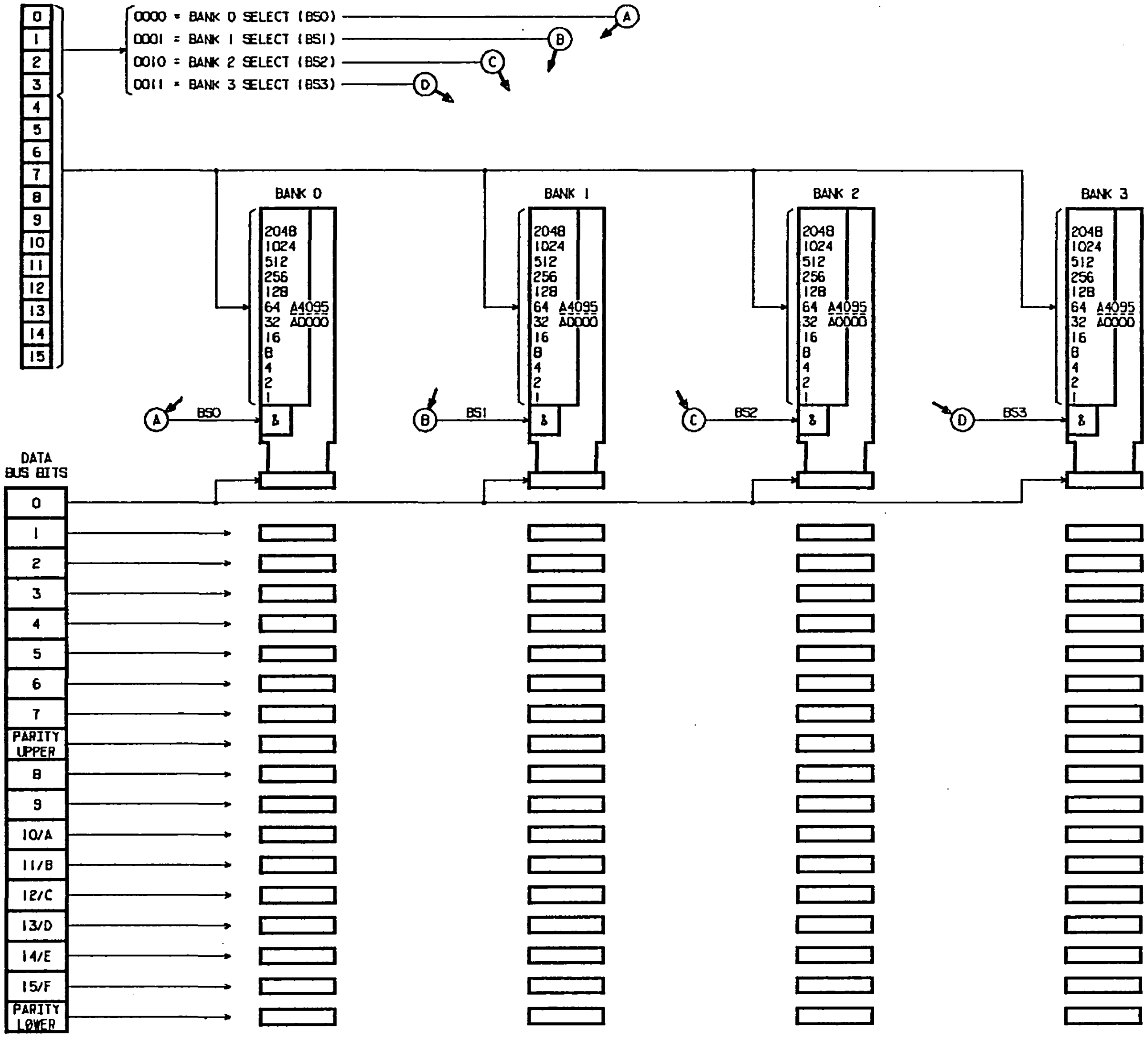

CONTROL DATA

DEVELOPMENT DIVISION

CCC MEMØRY BLØCK DIAGRAM

CODE IDENT | DWG NO | REV C

SIZE C | SHEET MEM BD | PAGE

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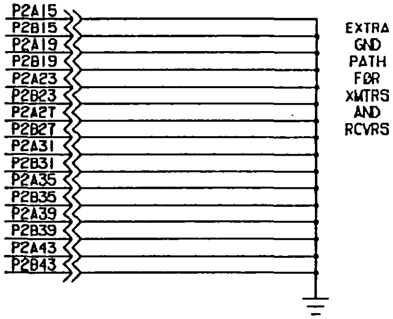
UNUSED IC'S

CHIP TYPE	LOCATION	OPEN PINS
537	4253	(13,12,11)

PAGE						REVISION RECORD					
6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	CA48908	CLASS A RELEASED	KMS	06/87	NS	NS



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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE PLACE ANGLES
± ± ±
MATERIAL
FINISH

DWN	M E SCHMIDT	06/87
CHKD	N SAMPSON	06/87
ENGR	L B ULFIG	06/87
MFG		
APVD	L B ULFIG	06/87

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
CYBER CHANNEL I/F

PWA-53584147 PWB-53030935

SIZE C FSCM NO. 34010 DWG NO. 22110693

LOC: A01 SHEET CYB I/F 1 PAGE 1 OF 6

CYBER INTERFACE - CHANNEL (A01-2)

R1 REGISTER

This register receives 12 data bits (Out 00 through Out 11) and an associated parity bit (Out Par) from the CYBER I/F channel during a write operation. The R1 register routes the data bits (R00 through R11) to a parity checker and the R2 register.

PARITY CHECKER

The output parity bit (Out Par) from the CYBER I/F channel is compared with the parity bit from the parity generator. If the two bits do not compare, the channel parity error (Chan PE) FF sets and a Chan PE signal is sent to the control flag register (A05-3).

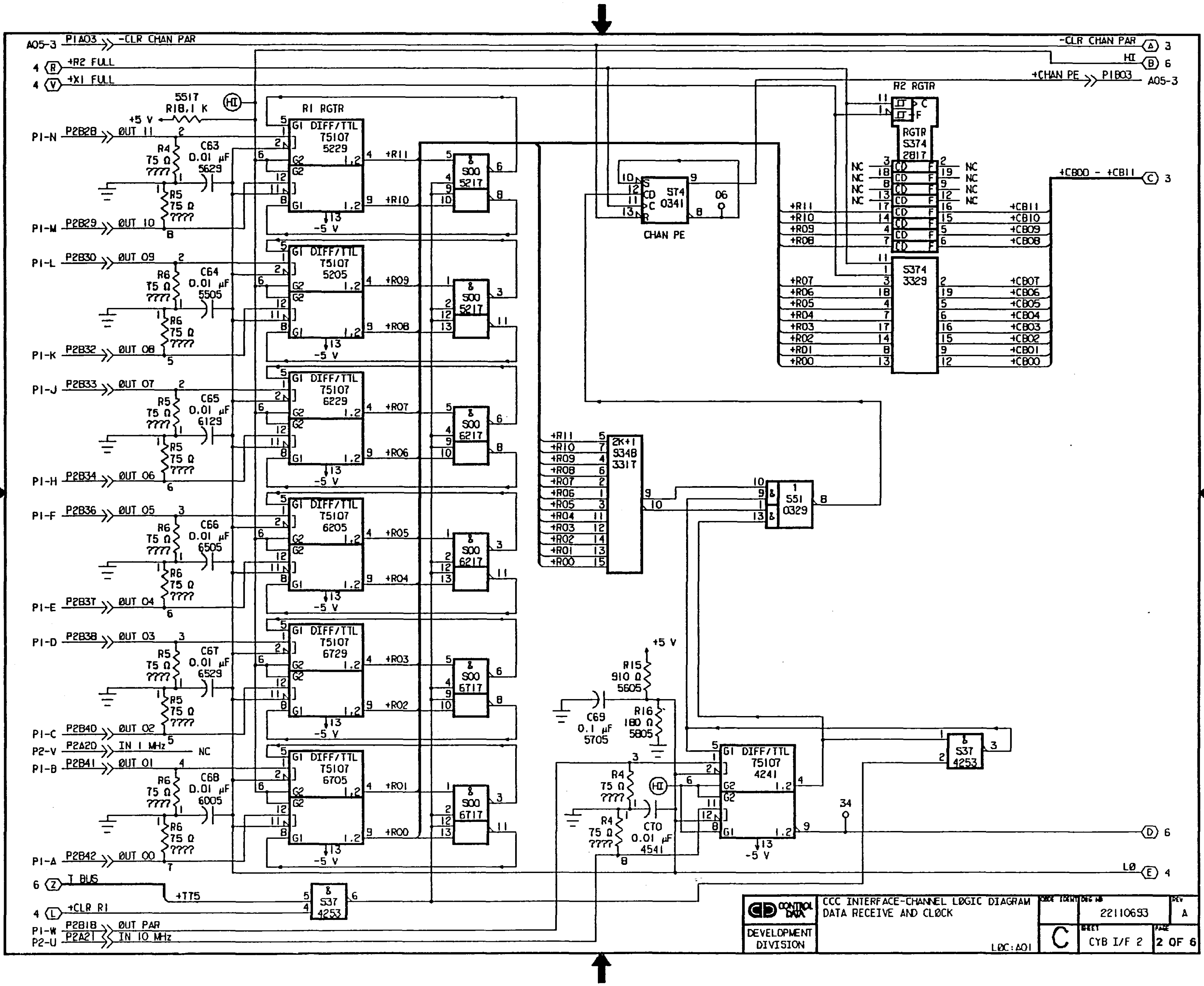
R2 REGISTER

During a write operation, data bits R00 through R11 are held in this register and then placed onto the channel bus (A01-3) as data bits CB00 through CB11.

During a read operation, the X1 full signal (A01-4) tri-states the R2 register (A01-2) to place it in an off condition. This allows the read data from A02-3 to be placed onto the channel bus.

IN 10 MHZ CLOCK

This channel clock signal is used to generate a 40-MHz clock and the T00, T25, T50, and T75 timing signals required for data control (A01-4).



CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM
DATA RECEIVE AND CLOCK

L0C:A01

C

DWG NO 22110693

REV A

SHEET CYB I/F 2

PAGE 2 OF 6

CYBER INTERFACE - CHANNEL (A01-3)

X2 REGISTER

This register receives the 12 data bits of the channel word (CB00 through CB11) from the channel bus during a read operation. The X2 register routes the data bits (0 through 11) to a parity generator and to associated driver circuits.

DRIVER

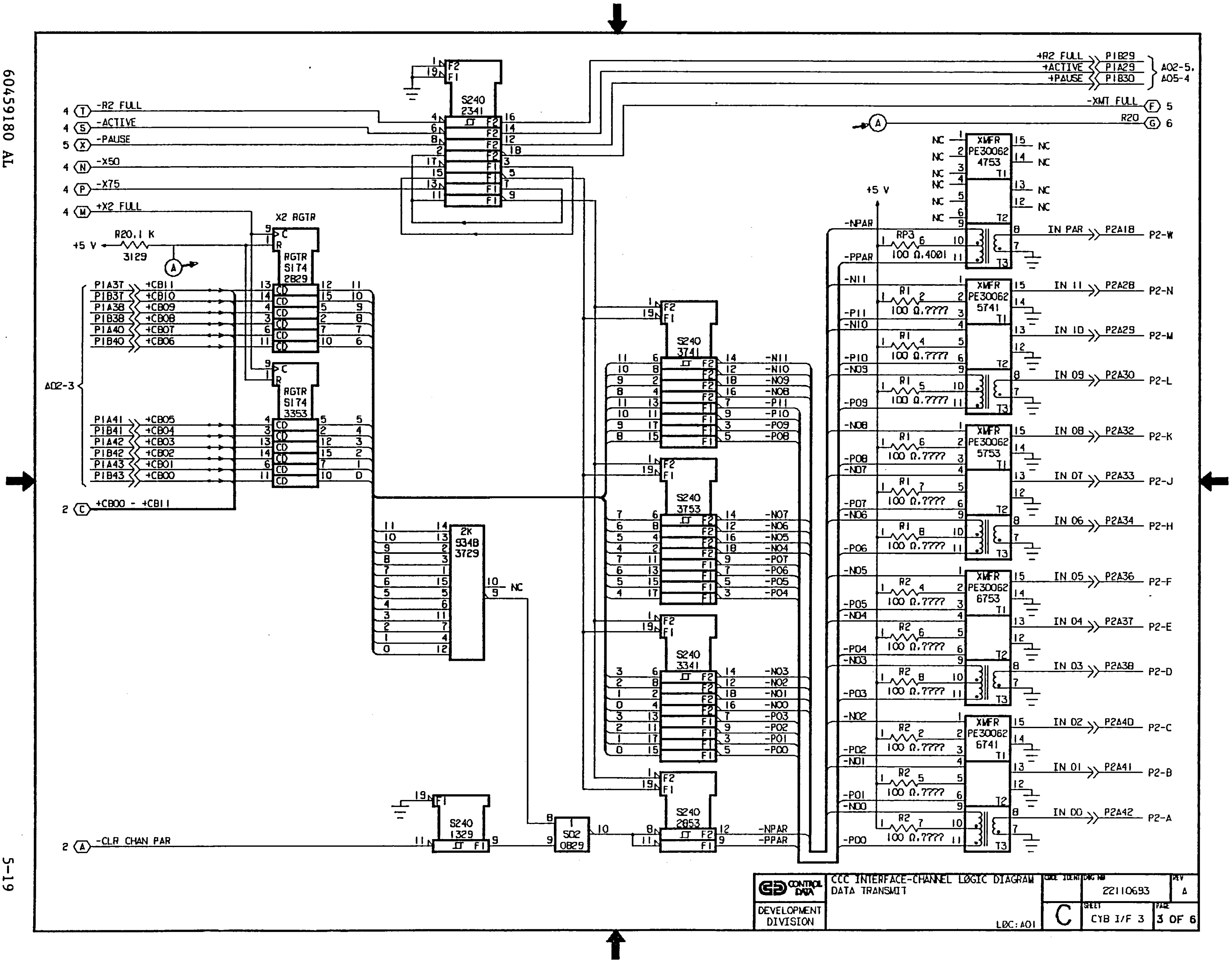
The driver circuits transmit the 12-bit channel words from the X2 register to the CYBER I/F channel. The X75 and X50 timing signals clock the positive-going half of the data bits (P00 through P11) and the negative-going half of the data bits (N00 through N11) through the driver and transformers, respectively.

PARITY GENERATOR

A parity bit is generated from the 12 channel bus data bits received from the X2 register. The parity bit (N Par or P Par) is gated through the driver circuit along with the data bits and is sent to the channel transmitters.

CHANNEL TRANSMITTERS

These transmitters send the 12 data bits and associated parity bit to the CYBER I/F channel.



CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM
DATA TRANSMIT

LOC:A01

CODE IDENT

DWG NO 22110693

REV A

C

SHEET CYB I/F 3

PAGE 3 OF 6

CHANNEL OUTPUT CONTROL SIGNALS

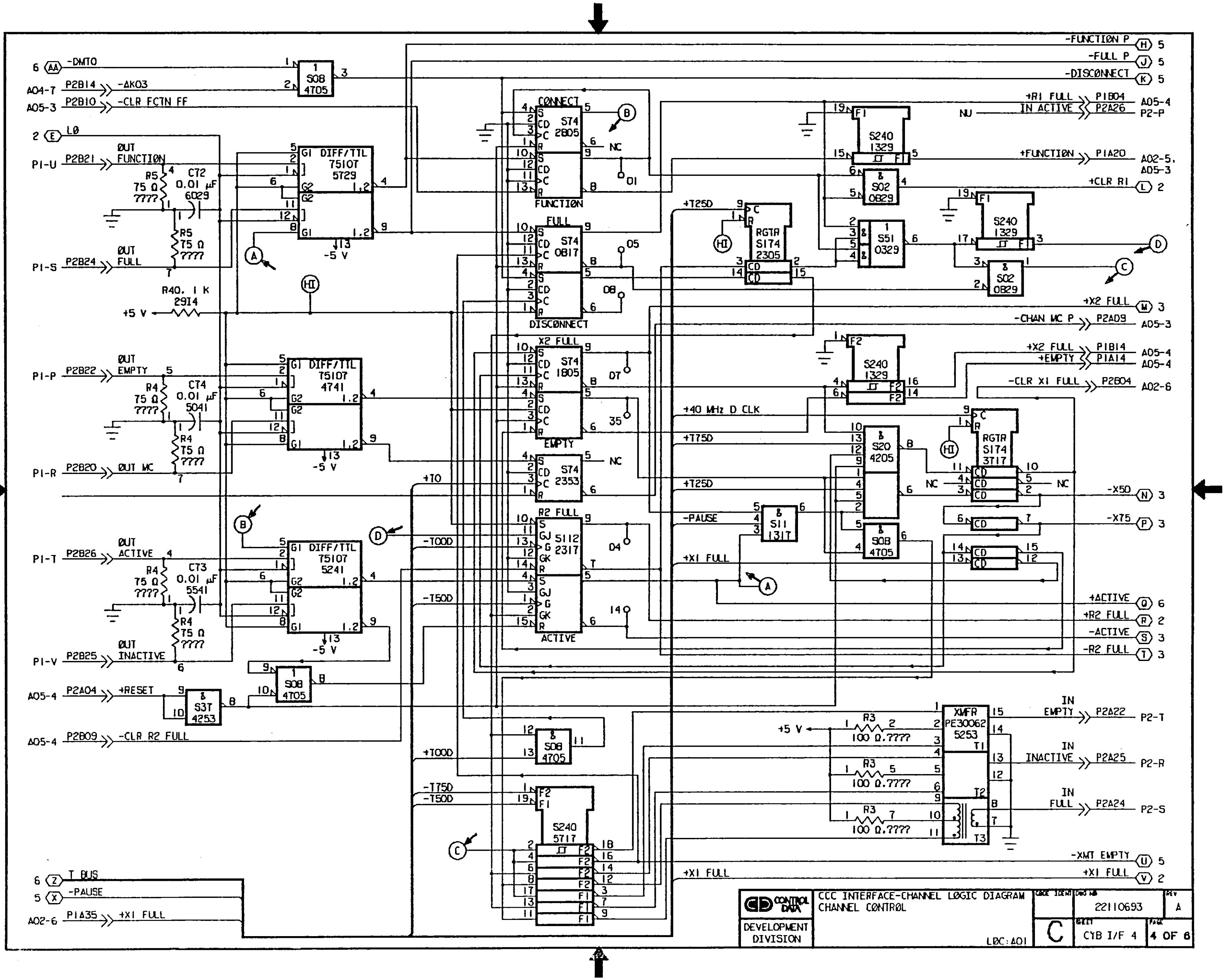
Differential receivers receive the Out Function, Out Full, Out Active, Out Inactive, Out Empty, and Out MC (Master Clear) signals from the CYBER channel I/F. These signals set corresponding FFs except for the Out Inactive signal. The FF outputs are sent to the status circuits (A05-4) except for the Out MC signal which is sent to (A05-3). The Out Inactive signal is used to clear the active FF.

CONNECT/DISCONNECT

The connect and disconnect FFs are set by a deadman timeout (DMTO) signal (A01-5) or a disconnect channel signal (AK03) from the CYBER channel I/F UDI (A04-7). The disconnect FF clocks the active FF and gates the In Inactive signal through its transmitter to the CYBER I/F channel. The In Empty and In Full control signals are also sent to the CYBER channel I/F.

X2 FULL/R2 FULL

The X2 full and R2 full FFs control the data transfers during read and write operations, respectively.



CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM
CHANNEL CONTROL

LOC: A01

CODE IDENT

DWG NO 22110693

REV A

C

SHEET CYB I/F 4

PAGE 4 OF 6

CYBER INTERFACE - CHANNEL (A01-5)

PAUSE

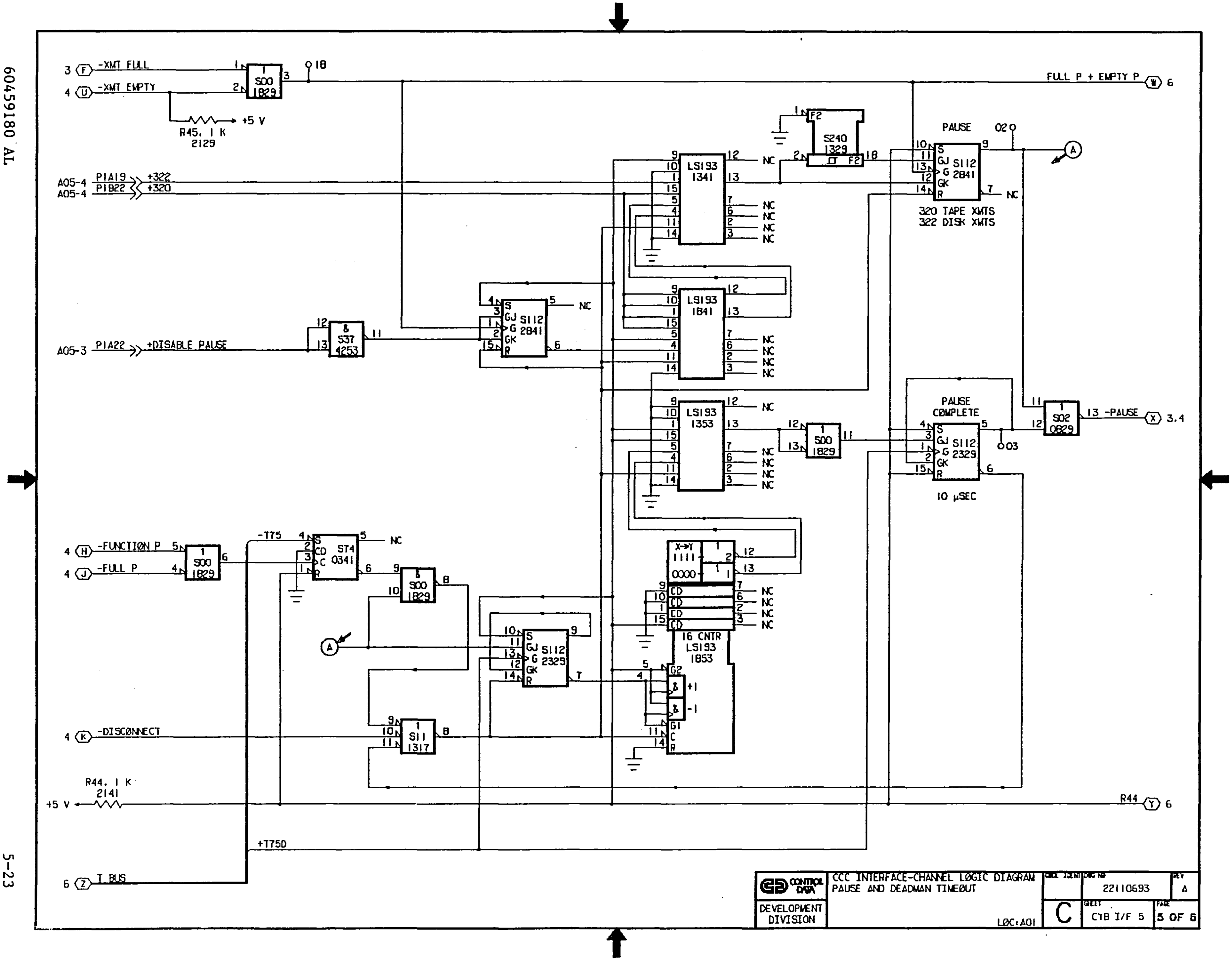
During a write operation, the pause FF sets when the CYBER channel I/F sends each group of 320 12-bit tape words. The pause FF clears in 10± 1 μs (pause complete) or when the next Out Full signal (A01-4), or Out Function signal (A01-4) is sent by the CYBER channel I/F. Termination of the write operation is indicated when the pause FF is clear and the channel is inactive. This allows two peripheral processors to perform a chained write operation.

During a read operation, the CYBER interface pauses for 10± 1 μs after sending each group of 320 12-bit tape words to the CYBER channel. This allows two peripheral processors to perform a chained read operation.

The pause FF also sets after the CYBER channel interface sends 322 12-bit disk words to the CYBER channel. The resulting Pause signal (A01-4) is sent to the status circuits (A05-4) where a DMA Complete signal is generated. This allows the microcode to disconnect the channel which, in turn, clears the pause FF.

DEADMAN TIMEOUT

This circuit monitors an active channel for a hung condition during a read or write operation. If the channel does not transfer a word for 8.5± 1.5 s, the CYBER interface deactivates the channel (A01-4) and sets the deadman timeout FF (A05-3).



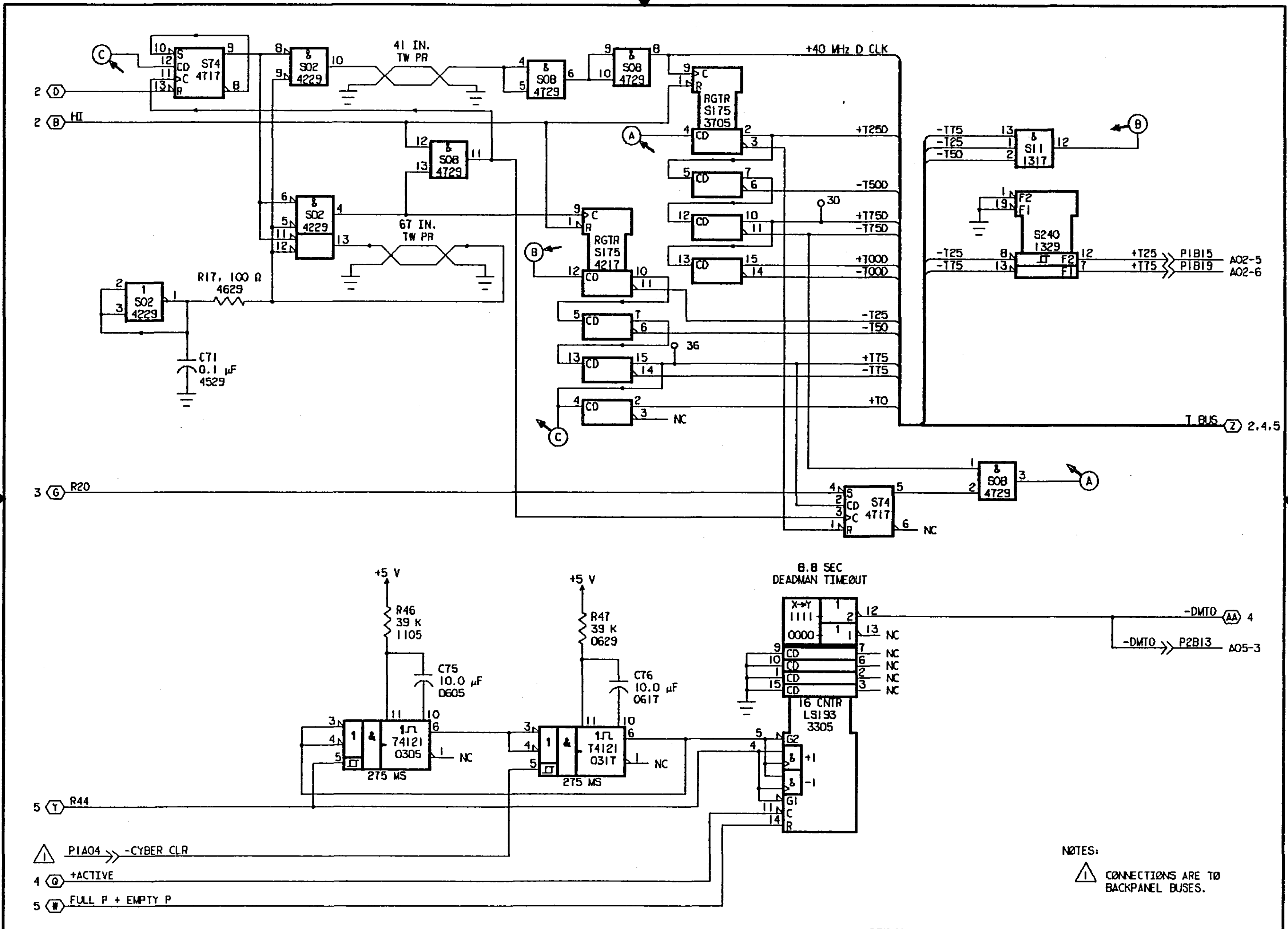
CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM
PAUSE AND DEADMAN TIMEOUT

LOC:A01

CODE IDENT	DWG NO	REV
	22110693	A
C	SHEET CYB I/F 5	PAGE 5 OF 6



CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM

LOC: A01

CODE IDENT	DWG NO	REV
C	22110693	A
	SHEET CYB I/F 6	PAGE 6 OF 6

PAGE						REVISION RECORD					
6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	LU
B	B	B	B	B	B	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/21/87	NS	NS
C	B	B	B	B	C	CA48667	INCREASED TW/PR TO 63 IN., PAGE 6	MES	3/12/87	NS	NS
C	B	B	B	B	D	CA48908	NEW PWB NUMBER	KMS	5/12/87	NS	NS

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TOLERANCES

PLACE ± PLACE ± ANGLES ±

MATERIAL

FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	L.B. ULFIG	07/85
MFG	J. NOES	07/85
APVD	L.B. ULFIG	07/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
CYBER CHANNEL I/F

PWA-23140103

PWB-23140104

SIZE	FSCM NO.	DWG NO.
C	34010	23140105

LOC: A01 SHEET I/F 1 PAGE 1 OF 6

CYBER INTERFACE - CHANNEL (A01-2)

R1 REGISTER

This register receives 12 data bits (Out 00 through Out 11) and an associated parity bit (Out Par) from the CYBER I/F channel during a write operation. The R1 register routes the data bits (R00 through R11) to a parity checker and the R2 register.

PARITY CHECKER

The output parity bit (Out Par) from the CYBER I/F channel is compared with the parity bit from the parity generator. If the two bits do not compare, the channel parity error (Chan PE) FF sets and a Chan PE signal is sent to the control flag register (A05-3).

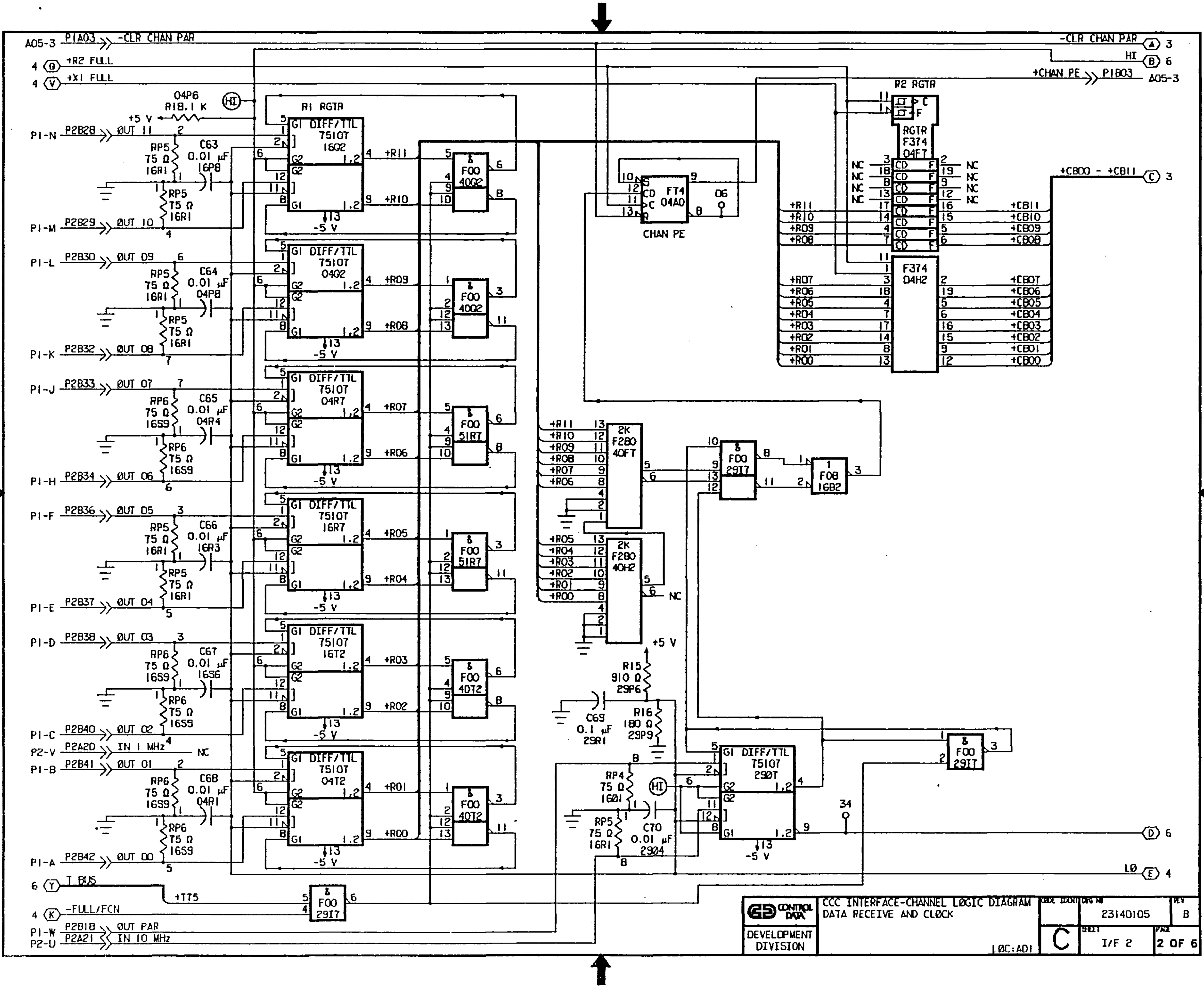
R2 REGISTER

During a write operation, data bits R00 through R11 are held in this register and then placed onto the channel bus (A01-3) as data bits CB00 through CB11.

During a read operation, the X1 full signal (A01-4) tri-states the R2 register (A01-2) to place it in an off condition. This allows the read data from (A02-3) to be placed onto the channel bus.

IN 10 MHZ CLOCK

This channel clock signal is used to generate a 40-MHz clock and the T00, T25, T50, and T75 timing signals required for data control (A01-4).



CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LØGIC DIAGRAM
DATA RECEIVE AND CLØCK

LØC:ADI

C

23140105

B

I/F 2

2 OF 6

CYBER INTERFACE - CHANNEL (A01-3)

X2 REGISTER

This register receives the 12 data bits of the channel word (CB00 through CB11) from the channel bus during a read operation. The X2 register routes the data bits (0 through 11) to a parity generator and to associated driver circuits.

DRIVER

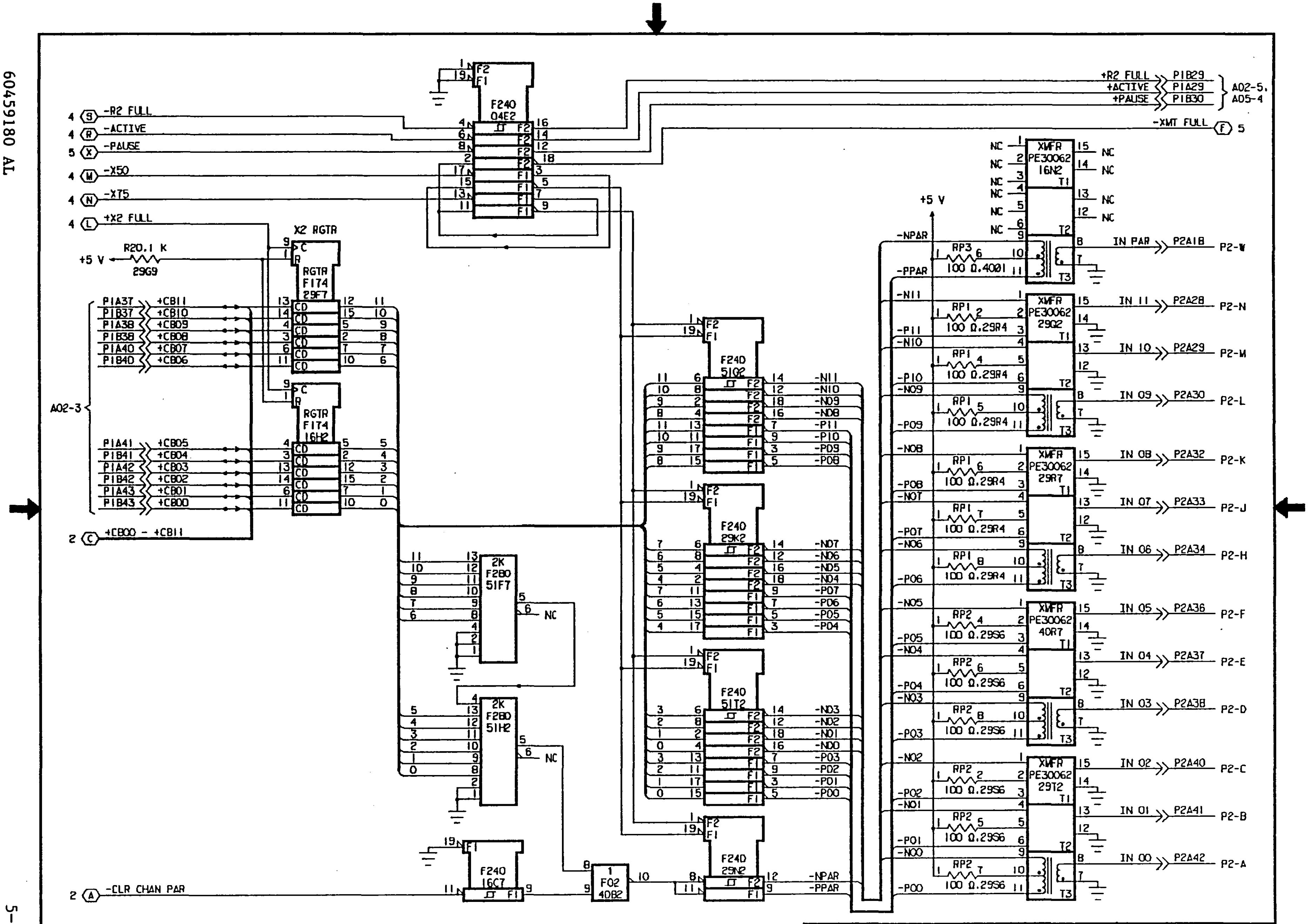
The driver circuits transmit the 12-bit channel words from the X2 register to the CYBER I/F channel. The X75 and X50 timing signals clock the positive-going half of the data bits (P00 through P11) and the negative-going half of the data bits (N00 through N11) through the driver and transformers, respectively.

PARITY GENERATOR

A parity bit is generated from the 12 channel bus data bits received from the X2 register. The parity bit (N Par or P Par) is gated through the driver circuit along with the data bits and is sent to the channel transmitters.

CHANNEL TRANSMITTERS

These transmitters send the 12 data bits and associated parity bit to the CYBER I/F channel.



CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM
DATA TRANSMIT

LOC:AD1

CODE IDENT	DWG NO	REV
C	23140105	B
	SHEET I/F 3	PAGE 3 OF 6

CYBER INTERFACE - CHANNEL (A01-4)

CHANNEL OUTPUT CONTROL SIGNALS

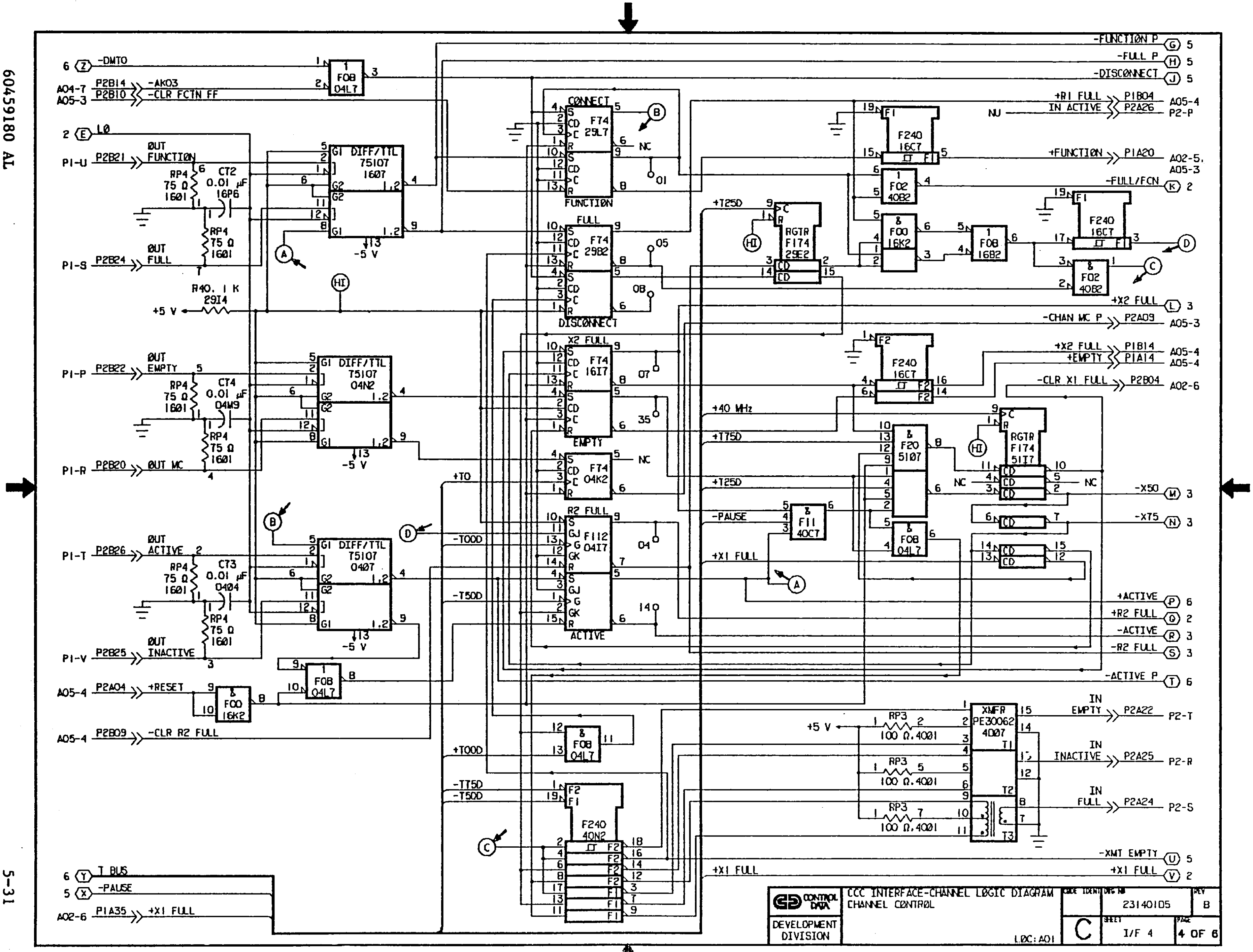
Differential receivers receive the Out Function, Out Full, Out Active, Out Inactive, Out Empty, and Out MC (Master Clear) signals from the CYBER channel I/F. These signals set corresponding FFs except for the Out Inactive signal. The FF outputs are sent to the status circuits (A05-4) except for the Out MC signal which is sent to (A05-3). The Out Inactive signal is used to clear the active FF.

CONNECT/DISCONNECT

The connect and disconnect FFs are set by a deadman timeout (DMTO) signal (A01-5) or a disconnect channel signal (AK03) from the CYBER channel I/F UDI (A04-7). The disconnect FF clocks the active FF and gates the In Inactive signal through its transmitter to the CYBER I/F channel. The In Empty and In Full control signals are also sent to the CYBER channel I/F.

X2 FULL/R2 FULL

The X2 full and R2 full FFs control the data transfers during read and write operations, respectively.



CONTROL DATA

DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM
CHANNEL CONTROL

LOC: A01

CODE IDENT | DWG NO 23140105 | REV B

C | SHEET I/F 4 | PAGE 4 OF 6

CYBER INTERFACE - CHANNEL (A01-5)

PAUSE

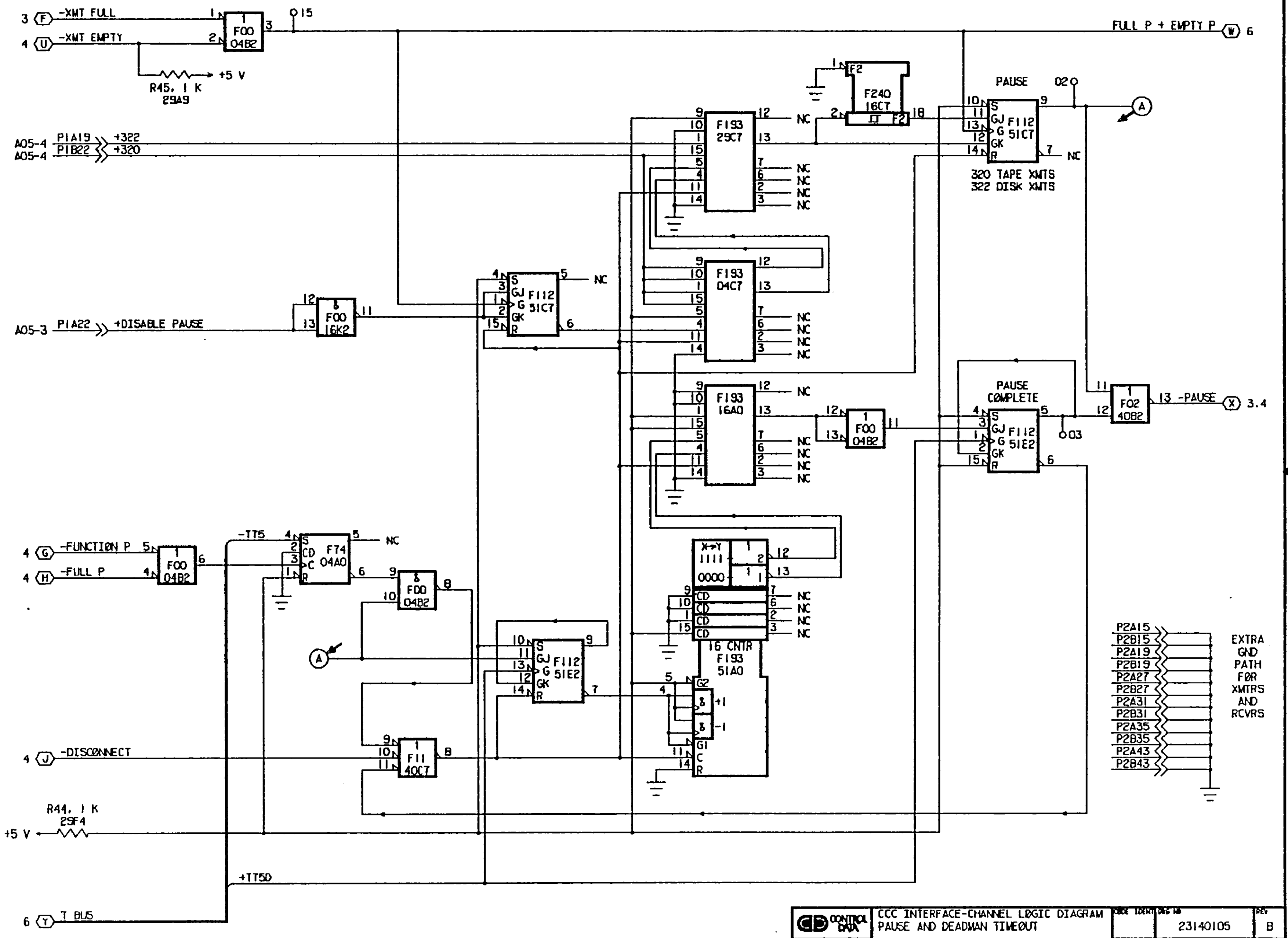
During a write operation, the pause FF sets when the CYBER channel I/F sends each group of 320 12-bit tape words. The pause FF clears in 10± 1 μs (pause complete) or when the next Out Full signal (A01-4), or Out Function signal (A01-4) is sent by the CYBER channel I/F. Termination of the write operation is indicated when the pause FF is clear and the channel is inactive. This allows two peripheral processors to perform a chained write operation.

During a read operation, the CYBER interface pauses for 10± 1 μs after sending each group of 320 12-bit tape words to the CYBER channel. This allows two peripheral processors to perform a chained read operation.

The pause FF also sets after the CYBER channel interface sends 322 12-bit disk words to the CYBER channel. The resulting Pause signal (A01-4) is sent to the status circuits (A05-4) where a DMA Complete signal is generated. This allows the microcode to disconnect the channel which, in turn, clears the pause FF.

DEADMAN TIMEOUT

This circuit monitors an active channel for a hung condition during a read or write operation. If the channel does not transfer a word for 8.5± 1.5 s, the CYBER interface deactivates the channel (A01-4) and sets the deadman timeout FF (A05-3).



CONTROL DATA
DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM
PAUSE AND DEADMAN TIMEOUT

LOC: A01

CODE IDENT
DWG NO 23140105
REV B
C
SHEET I/F 5
PAGE 5 OF 6

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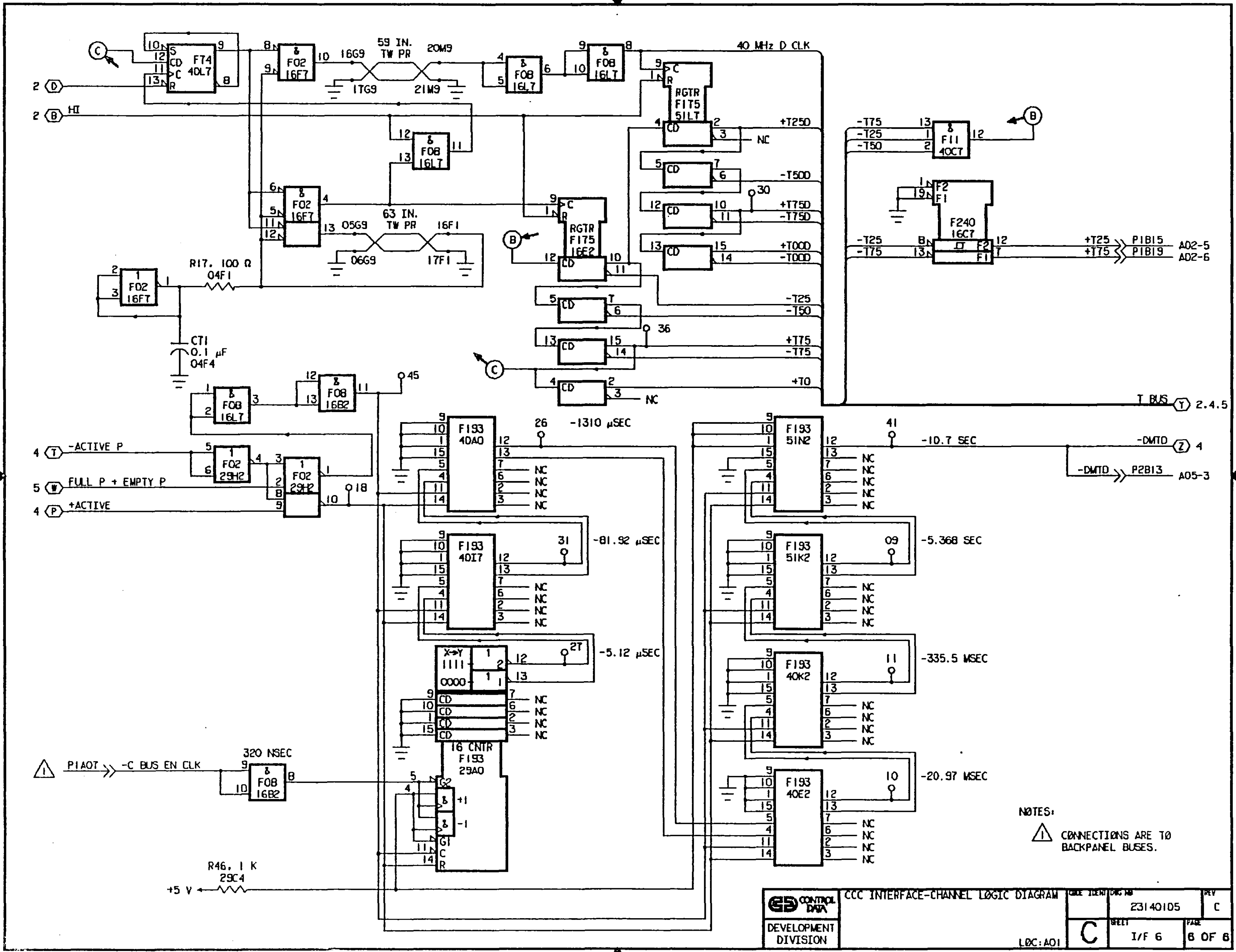

NOTES:
1. CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA
DEVELOPMENT DIVISION

CCC INTERFACE-CHANNEL LOGIC DIAGRAM

LOC: A01

CODE IDENT | DWG NO 23140105 | REV C

C | SHEET I/F 6 | PAGE 6 OF 8

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UNUSED IC'S

CHIP TYPE	LOCATION	OPEN PINS
F00	52L7	(9.10.8)
F02	28T2	(12.11.13).(2.3.1)
F08	16R7	(12.13.11)

PAGE						REVISION RECORD					
6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	CA48908	CLASS A RELEASED	KMS	06/87	NS	NS

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DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±

MATERIAL

FINISH

DWN	M E SCHMIDT	06/87
CHKD	N SAMPSON	06/87
ENGR	R T HENNING	06/87
MFG		
APVD	L B ULFIG	06/87

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

TITLE
LOGIC DIAGRAM
CYBER DATA BUS I/F

PWA-53590792 PWB-53030939

SIZE	FSCM NO.	DWG NO.
C	34010	22110694

LOC: A02 SHEET DATA BUS 1 PAGE 1 OF 6

CYBER INTERFACE - DATA (A02-2)

9-TRACK/DISK AND 7-TRACK R3 REGISTERS

These registers assemble data during 9-track tape, disk, and 7-track tape direct memory access (DMA) write operations. The registers receive 12-bit words (bits CB00 through CB11) from the CYBER channel bus.

The 9-track/disk R3 register is a 24-bit register that assembles two 12-bit channel words into three 8-bit bytes to form 16-bit coupler memory words.

The 7-track R3 register is a 16-bit register that assembles one 12-bit channel word into two 8-bit bytes to form 16-bit coupler memory words. The upper two bits of the 8-bit bytes are not used (forced to zeros).

Data is gated from the R3 register to the DMA T register in 8-bit bytes. For 8-bit channels, the 8-bit byte is stored simultaneously in both the upper (bits 0 through 7) and lower (bits 8 through 15) bytes of the DMA T register. Both bytes are sent to the data bus transmitters (A02-4) and written into memory (A10-5), but only the upper byte is used. For 16-bit channels, the 8-bit bytes are assembled a byte at a time beginning with the upper byte of the DMA register. Both bytes are then written into memory and the whole word (16 bits) is used. If an odd number of bytes is to be written, the lower byte of the DMA T register is zero-filled before being transferred to memory and an Odd Byte Write signal (A02-6) is sent to the transfer logic (A14-7).

UDI R3 REGISTER

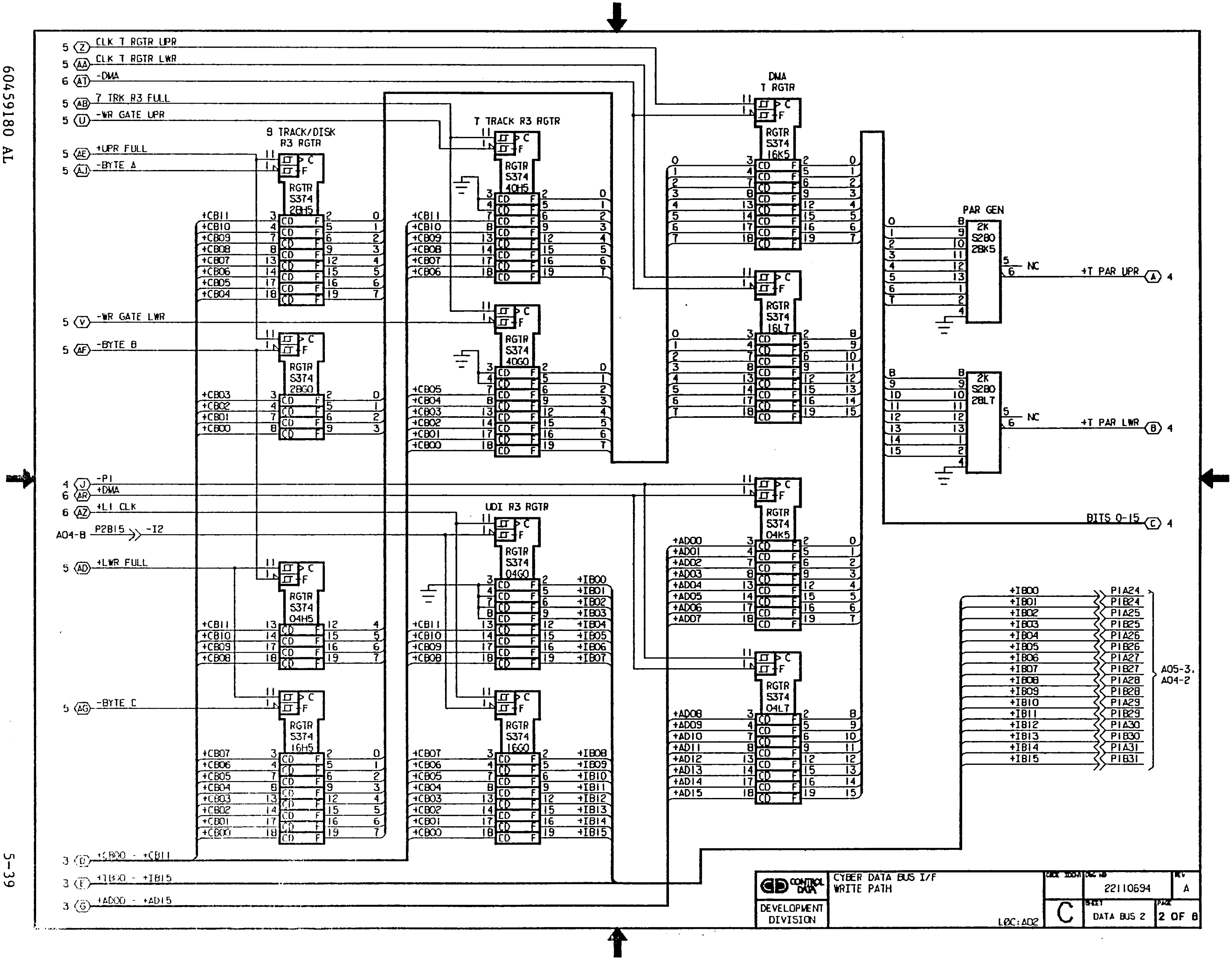
This 16-bit register is used during a universal device interface (UDI) write operation. The register receives 12-bit channel words (bits CB00 through CB11) from the CYBER channel bus. The register sends 12-bit channel words (bits IB04 through IB15) to the UDI (A04-2) for assembly into 16-bit coupler memory words. These 16-bit words are routed from the UDI through the UDI T register and data bus transmitters (A02-4) and written into memory (A10-5).

DMA AND UDI T REGISTERS

The DMA T register assembles words directly from the 9-track/disk and 7-track R3 registers. The UDI T register receives the assembled words (bits AD00 through AD15) from the UDI (A04-4). The upper and lower 8-bit data bytes are sent to parity generators and to data bus transmitters (A02-4).

PARITY GENERATION

Parity bits are generated (odd parity) for each upper and lower 8-bit data byte sent by the T registers. The parity bits are sent with the data bytes to the data bus transmitters (A02-4).



CONTROL DATA
DEVELOPMENT DIVISION

CYBER DATA BUS I/F
WRITE PATH

LØC:AD2

DWG NO 22110694
REV A
C
SHEET DATA BUS 2
PAGE 2 OF 8

CYBER INTERFACE - DATA (A02-3)

DB1 REGISTER

This register receives 16-bit coupler memory words (bits DB00 through DB15) from the data bus receivers (A02-4) during a DMA or UDI read operation. The DB1 register sends the 16-bit words to the 16 to 8 MUX for a DMA read operation, to the DB2 register for a UDI read operation, and to the parity check circuit (A02-4).

16 to 8 MUX

This multiplexer selects the upper 8-bit bytes (bits 0 through 7) or lower 8-bit bytes (bits 8 through 15) of the 16-bit coupler memory words during a DMA read operation. Only the upper bytes are selected for 8-bit read mode. The odd byte signal (A02-5) gates the lower byte through the multiplexer in 16-bit read mode. The multiplexer sends the 8-bit bytes to the 9-track/disk and 7-track X1 registers.

DB2 REGISTER

This register receives 16-bit coupler memory words from the DB1 register during a UDI read operation. The register sends the 16-bit coupler memory words to the UDI (A04-2) for disassembly.

9-TRACK/DISK AND 7-TRACK X1 REGISTERS

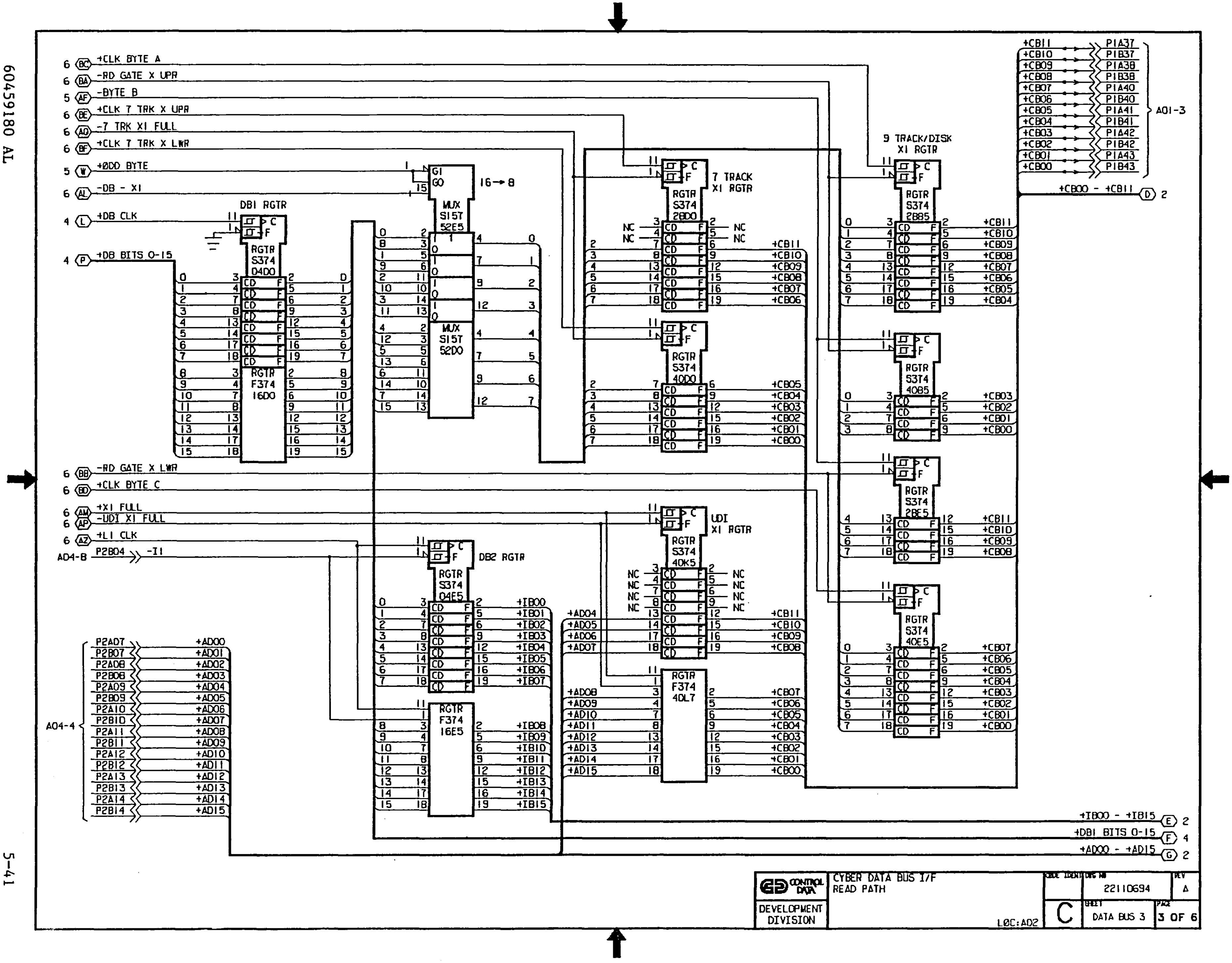
These registers disassemble data during 9-track tape, disk, and 7-track tape DMA read operations. The registers receive 8-bit bytes from the 16- to 8-bit multiplexer.

The 9-track/disk X1 register is a 24-bit register that disassembles three 8-bit coupler memory bytes into two 12-bit channel words. The 7-track X1 register is a 16-bit register that disassembles two 8-bit coupler memory bytes into one 12-bit channel word. The upper two bits of the coupler memory bytes are not used.

The 12-bit channel words are sent from the X1 registers to the channel bus and routed through the X2 register (A01-3) and channel transmitters (A01-3) for transmission to the CYBER channel I/F.

UDI X1 REGISTER

This 16-bit register is used during a UDI read operation. The register receives 12-bit channel words (bits AD04 through AD15) from the UDI disassembly circuit (A04-4). The 12-bit channel words are sent from the UDI X1 register to the CYBER channel in the same manner as those from the 9-track/disk and 7-track X1 registers.



CONTROL DATA

DEVELOPMENT DIVISION

CYBER DATA BUS I/F
READ PATH

LØC:AD2

CODE IDENT | DWG NO 22110694 | REV A

C | SHEET DATA BUS 3 | PAGE 3 OF 6

CYBER INTERFACE - DATA (A02-4)

DATA BUS TRANSMITTERS

During a coupler write operation, assembled 16-bit words from the DMA or UDI T register (A02-2) and two parity bits are sent to the transmitters and placed onto the bidirectional data bus. The 16-bit words and parity bits are then written into memory (A10-5).

DATA BUS RECEIVERS

During a coupler read operation, 16-bit words and two parity bits are read from memory onto the data bus and sent to the receivers on the same bidirectional pins used by the data bus transmitters. The receivers send the 16-bit coupler memory word to the DB1 register (A02-3) and to the parity check circuit along with the two parity bits.

PARITY CHECK

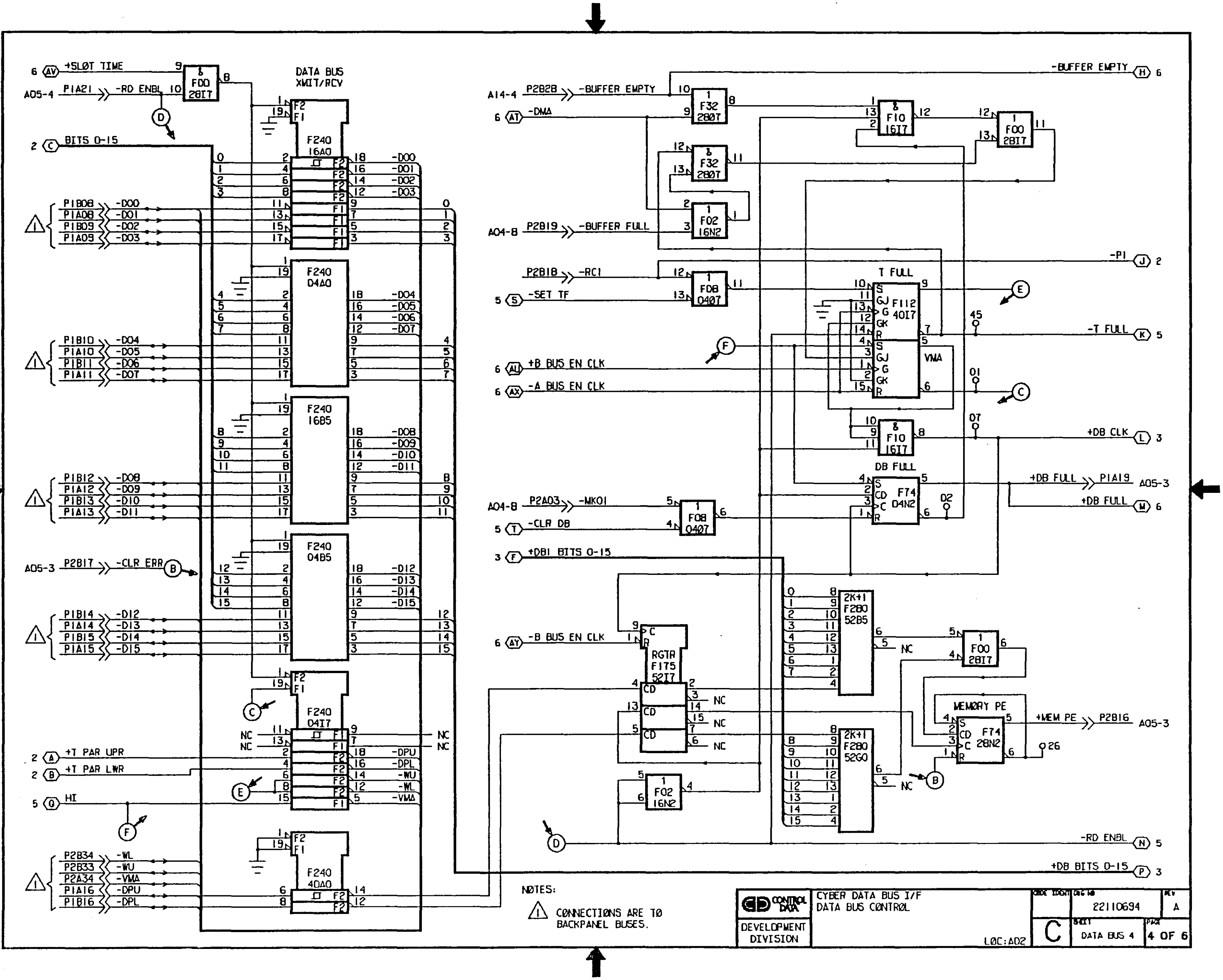
A check for odd parity is performed on the upper and lower 8-bit bytes of the 16-bit coupler memory word from the DB1 register (A02-3) and the associated parity bits from the 520S register. A parity error sets the memory parity FF, and a Mem PE (Memory Parity Error) signal is sent to the control flag register (A05-3).

DATA BUS CONTROL SIGNALS

The valid memory address (VMA) FF enables transfer of memory data during coupler read and write operations.

The DB Full FF and Buffer Empty signal (A14-5) control data transfers during a coupler read operation.

The T Full FF and Buffer Full signal (A14-5) control data transfers during a coupler write operation.



NOTES:

⚠ CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA

DEVELOPMENT DIVISION

CYBER DATA BUS I/F
DATA BUS CONTROL

LOC:A02

C

22110694

A

DATA BUS 4

4 OF 6

CYBER INTERFACE - DATA (A02-5)

DATA WRITE CONTROL

This logic provides the signals needed to control data transfers during a coupler write operation. Some signals are also used during coupler read operations.

The outputs of the byte A, B, and C FFs and 9-track/disk R3 upper and lower full FFs on this diagram (A02-5) gate 8-bit data bytes through the 9-track/disk R3 registers (A02-2).

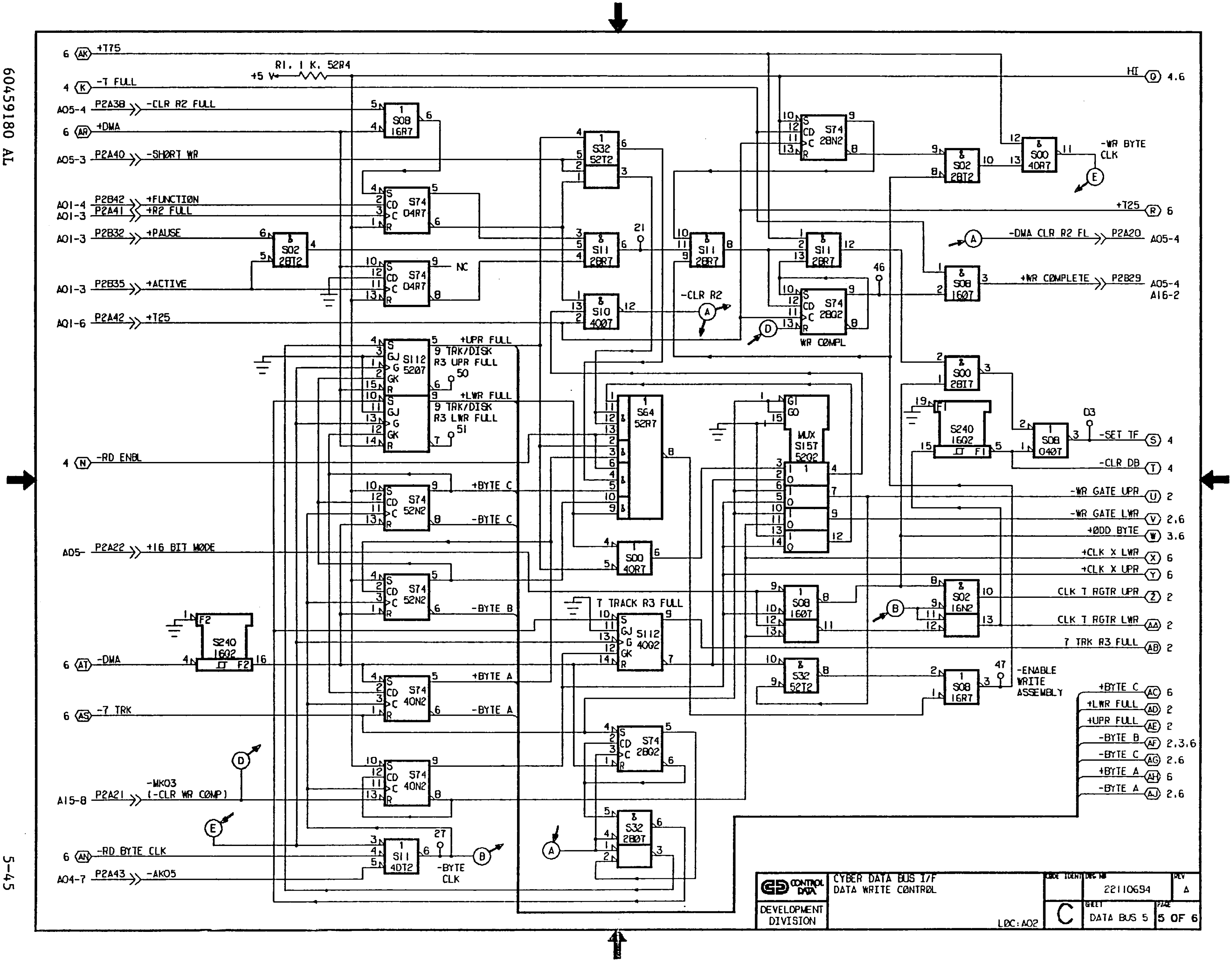
The output of the 7-track R3 full FF and the Write Gate Upper and Write Gate Lower signals gate 8-bit data bytes through the 7-track R3 register (A02-2).

The Clock T Register Upper and Clock T Register Lower signals clock 8-bit data bytes into the DMA T register (A02-2).

The output of the write complete FF informs the CYBER channel interface (A05-4), the FIPS stream logic (A16-2), and the FIPS transfer logic (A14-7) that the write operation is finished.

The outputs of the byte A, B, and C FFs are also sent to the DMA read control circuit (A02-6) for gating 8-bit bytes into the 9-track/disk X1 register.

The Clock X Upper and Clock X Lower signals are used to gate two 8-bit bytes into the 7-track X1 register for DMA read control (A02-6).



CONTROL DATA

CYBER DATA BUS I/F
DATA WRITE CONTROL

DEVELOPMENT DIVISION

LOC: A02

CODE IDENT	DWG NO	REV
C	22110694	A
	SHEET DATA BUS 5	PAGE 5 OF 6

DMA READ CONTROL

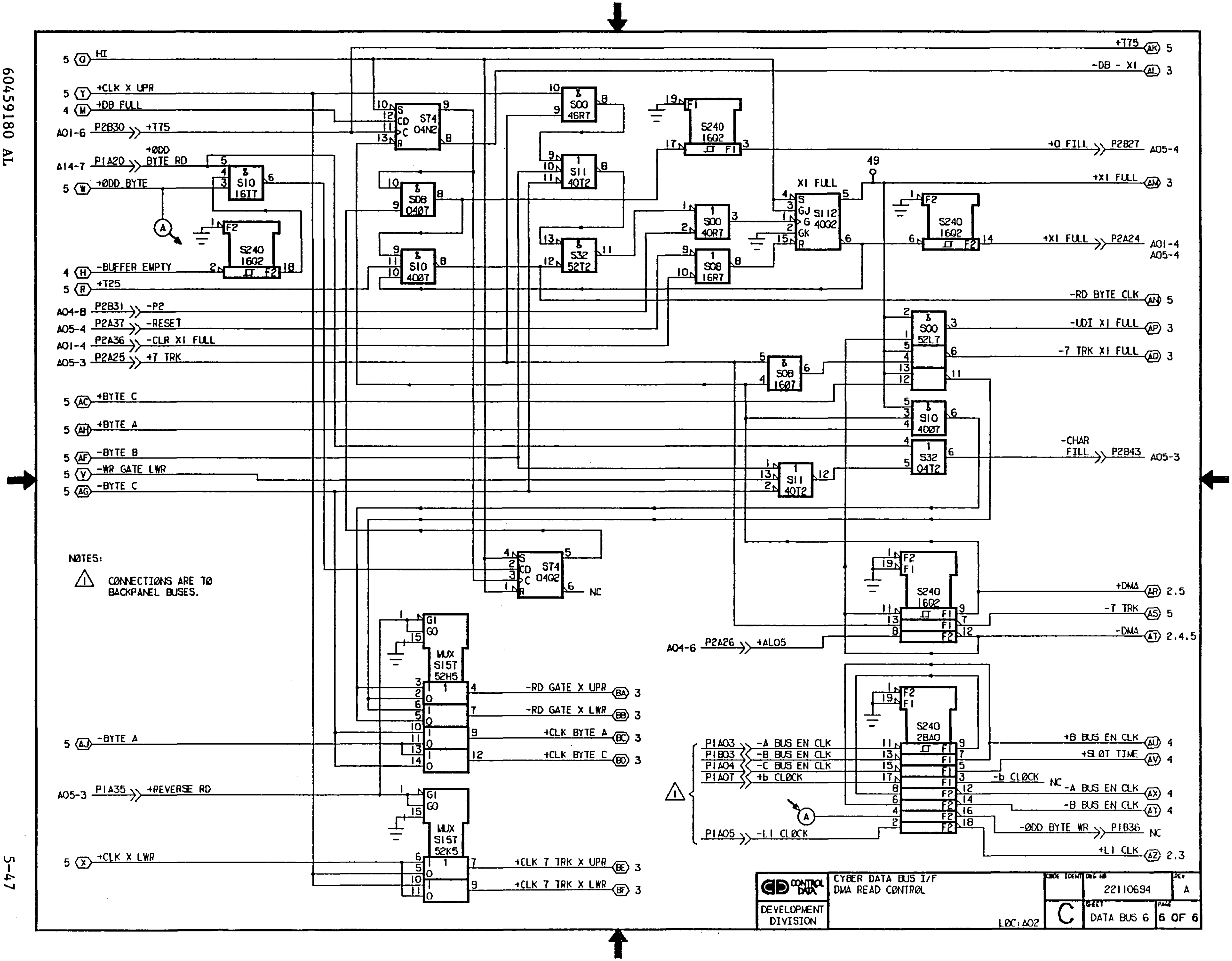
The DMA read control logic provides the signals needed to control data transfers during a DMA read operation.

The output of the X1 full FF enables data to transfer from the UDI, 7-track, or 9-track/disk X1 register (A02-3) to the CYBER channel bus.

The Clock Byte A, and Clock Byte C signals are used to gate data into the 9-track/disk X1 register (A02-3). The Read Gate X Upper and Read Gate X Lower signals gate data from the 9-track/disk X1 register (A02-3), onto the channel bus, to the X2 register (A01-3).

The Clock 7-Track X Upper and Clock 7-Track X Lower signals gate data into the 7-track X1 register (A02-3). The 7-Track X1 Full signal gates data from the 7-track X1 register onto the channel bus, and to the X2 register (A01-3).

The X1 Full signal latches data from the UDI assembly/disassembly register (A04-4) into the UDI X1 register (A02-3). The UDI X1 Full signal gates data from the UDI X1 register onto the channel bus, to the X2 register (A01-3).



NOTES:

⚠ CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA

DEVELOPMENT DIVISION

CYBER DATA BUS I/F
DMA READ CONTROL

LOC: A02

C

DWG NO 22110694

REV A

DATA BUS 6

PAGE 6 OF 6

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UNUSED IC'S

CHIP TYPE	LOCATION	OPEN PINS
F00	52L7	(9.10.8)
F02	28T2	(12.11.13).(2.3.1)
F08	16R7	(12.13.11)

PAGE						REVISION RECORD					
6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A		CLASS A RELEASED	EFA	03/86	NZ	RTH
B	B	B	B	B	B	CA47702	SEE NOTE 4	MES	8/21/86	NS	NS
C	C	C	C	C	C	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/30/87	NS	NS
D	C	C	C	C	D	CA48535	CHANGED F08 TO F00 AT LOC 52L7	MES	2/5/87	NS	NS

NOTES:

1. THIS DOCUMENT IS CONTAINED ON MAGNETIC TAPE. MAGNETIC TAPE IS STORED IN THE EDP GROUP OF ENGINEERING SERVICES SECTION.CDED DIVISION.
2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.
4. ALL CHIP IDENTIFIERS ON PWA-22179490 WERE CHANGED FROM 'S' TO 'F' TYPE CHIPS. EXAMPLE - 'F74' ON PWA-22179490 IS 'S74' ON PWA-53590792.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	E.F. ARLANDSON	12/85
CHKD	N. ZAK	12/85
ENGR	R.T. HENNING	03/86
MFG	B.J. REILAND	03/86
APVD	R.T. HENNING	03/86

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

TITLE

LOGIC DIAGRAM
CYBER DATA BUS I/F

PWA-22179490
PWB-22179491

SIZE C
FSCM NO. 34010
DWG NO. 22179492
LOC: A02
SHEET DATA BUS I-F
PAGE 1 OF 6

CYBER INTERFACE - DATA (A02-2)

9-TRACK/DISK AND 7-TRACK R3 REGISTERS

These registers assemble data during 9-track tape, disk, and 7-track tape direct memory access (DMA) write operations. The registers receive 12-bit words (bits CB00 through CB11) from the CYBER channel bus.

The 9-track/disk R3 register is a 24-bit register that assembles two 12-bit channel words into three 8-bit bytes to form 16-bit coupler memory words.

The 7-track R3 register is a 16-bit register that assembles one 12-bit channel word into two 8-bit bytes to form 16-bit coupler memory words. The upper two bits of the 8-bit bytes are not used (forced to zeros).

Data is gated from the R3 register to the DMA T register in 8-bit bytes. For 8-bit channels, the 8-bit byte is stored simultaneously in both the upper (bits 0 through 7) and lower (bits 8 through 15) bytes of the DMA T register. Both bytes are sent to the data bus transmitters (A02-4) and written into memory (A10-5), but only the upper byte is used. For 16-bit channels, the 8-bit bytes are assembled a byte at a time beginning with the upper byte of the DMA register. Both bytes are then written into memory and the whole word (16 bits) is used. If an odd number of bytes is to be written, the lower byte of the DMA T register is zero-filled before being transferred to memory and an Odd Byte Write signal (A02-6) is sent to the transfer logic (A14-7).

UDI R3 REGISTER

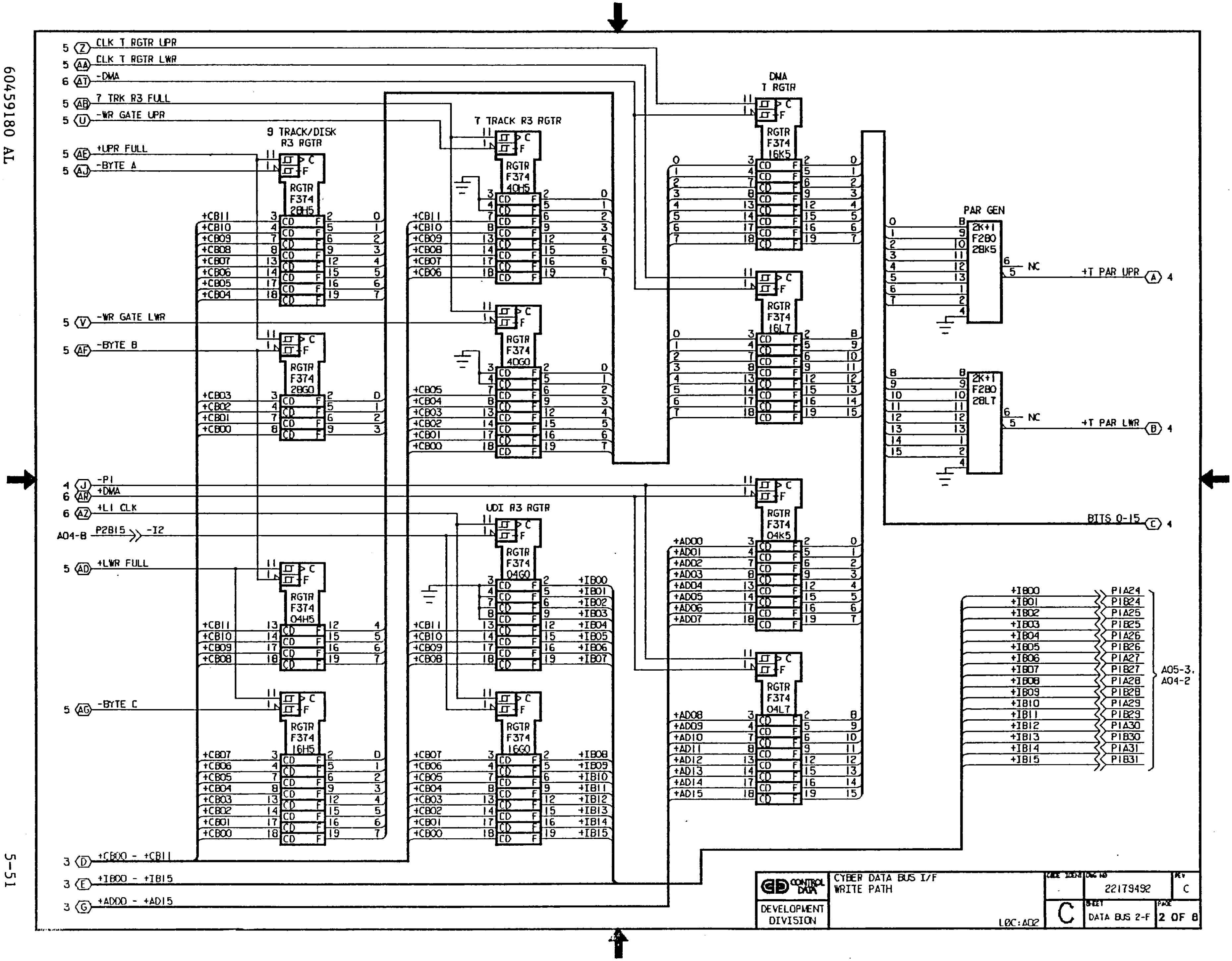
This 16-bit register is used during a universal device interface (UDI) write operation. The register receives 12-bit channel words (bits CB00 through CB11) from the CYBER channel bus. The register sends 12-bit channel words (bits IB04 through IB15) to the UDI (A04-2) for assembly into 16-bit coupler memory words. These 16-bit words are routed from the UDI through the UDI T register and data bus transmitters (A02-4) and written into memory (A10-5).

DMA AND UDI T REGISTERS

The DMA T register assembles words directly from the 9-track/disk and 7-track R3 registers. The UDI T register receives the assembled words (bits AD00 through AD15) from the UDI (A04-4). The upper and lower 8-bit data bytes are sent to parity generators and to data bus transmitters (A02-4).

PARITY GENERATION

Parity bits are generated (odd parity) for each upper and lower 8-bit data byte sent by the T registers. The parity bits are sent with the data bytes to the data bus transmitters (A02-4).



CONTROL DATA
DEVELOPMENT DIVISION

CYBER DATA BUS I/F
WRITE PATH

LOC:A02

CODE IDENT	DWG NO	REV
-	22179492	C
C	SHEET DATA BUS 2-F	PAGE 2 OF 8

CYBER INTERFACE - DATA (A02-3)

DB1 REGISTER

This register receives 16-bit coupler memory words (bits DB00 through DB15) from the data bus receivers (A02-4) during a DMA or UDI read operation. The DB1 register sends the 16-bit words to the 16 to 8 MUX for a DMA read operation, to the DB2 register for a UDI read operation, and to the parity check circuit (A02-4).

16 to 8 MUX

This multiplexer selects the upper 8-bit bytes (bits 0 through 7) or lower 8-bit bytes (bits 8 through 15) of the 16-bit coupler memory words during a DMA read operation. Only the upper bytes are selected for 8-bit read mode. The odd byte signal (A02-5) gates the lower byte through the multiplexer in 16-bit read mode. The multiplexer sends the 8-bit bytes to the 9-track/disk and 7-track X1 registers.

DB2 REGISTER

This register receives 16-bit coupler memory words from the DB1 register during a UDI read operation. The register sends the 16-bit coupler memory words to the UDI (A04-2) for disassembly.

9-TRACK/DISK AND 7-TRACK X1 REGISTERS

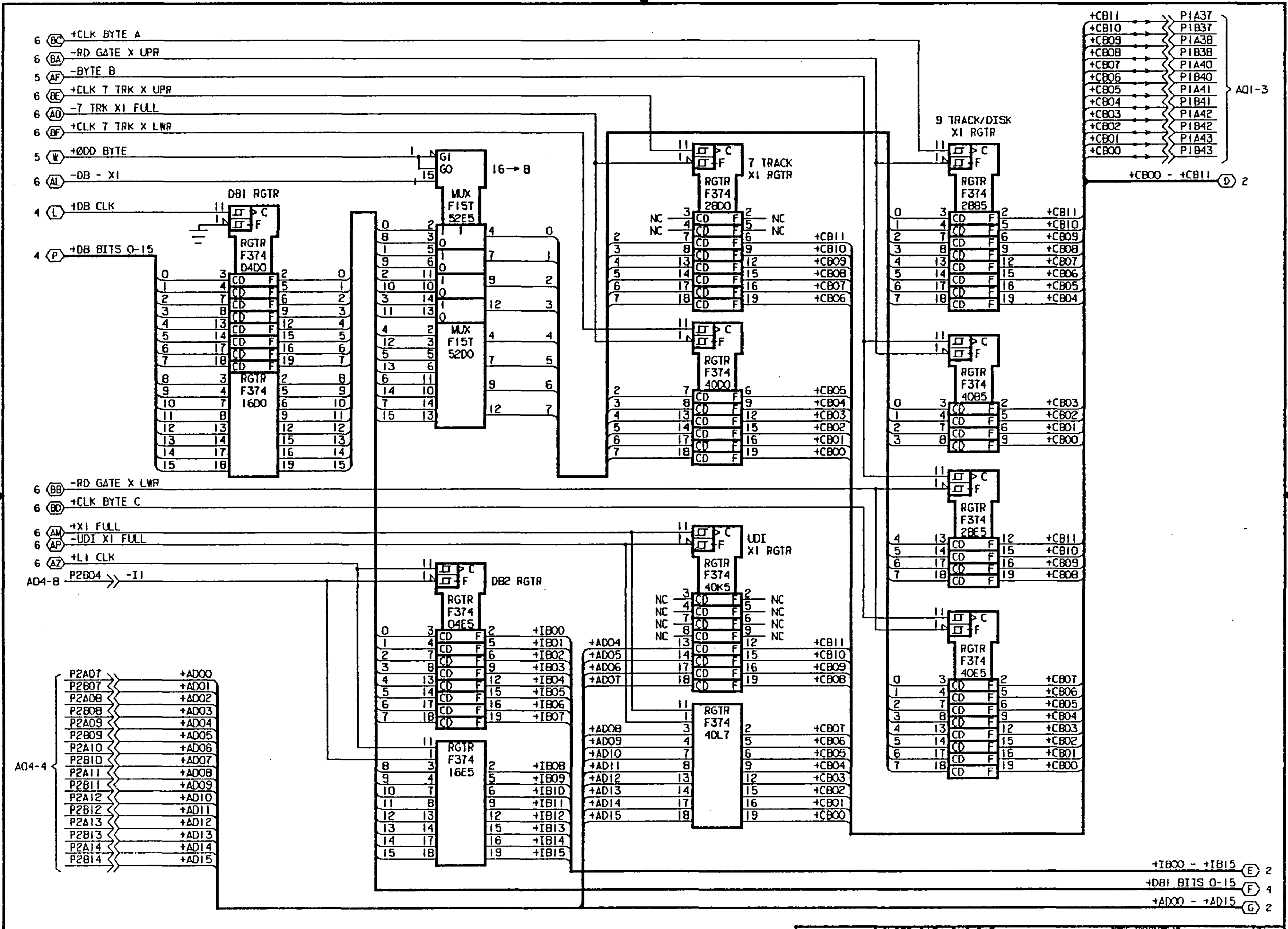
These registers disassemble data during 9-track tape, disk, and 7-track tape DMA read operations. The registers receive 8-bit bytes from the 16- to 8-bit multiplexer.

The 9-track/disk X1 register is a 24-bit register that disassembles three 8-bit coupler memory bytes into two 12-bit channel words. The 7-track X1 register is a 16-bit register that disassembles two 8-bit coupler memory bytes into one 12-bit channel word. The upper two bits of the coupler memory bytes are not used.

The 12-bit channel words are sent from the X1 registers to the channel bus and routed through the X2 register (A01-3) and channel transmitters (A01-3) for transmission to the CYBER channel I/F.

UDI X1 REGISTER

This 16-bit register is used during a UDI read operation. The register receives 12-bit channel words (bits AD04 through AD15) from the UDI disassembly circuit (A04-4). The 12-bit channel words are sent from the UDI X1 register to the CYBER channel in the same manner as those from the 9-track/disk and 7-track X1 registers.



CONTROL DATA

DEVELOPMENT DIVISION

CYBER DATA BUS I/F
READ PATH

LØC:AD2

DWG NO 22179492

REV C

C

SHEET DATA BUS 3-F

PAGE 3 OF 6

CYBER INTERFACE - DATA (A02-4)

DATA BUS TRANSMITTERS

During a coupler write operation, assembled 16-bit words from the DMA or UDI T register (A02-2) and two parity bits are sent to the transmitters and placed onto the bidirectional data bus. The 16-bit words and parity bits are then written into memory (A10-5).

DATA BUS RECEIVERS

During a coupler read operation, 16-bit words and two parity bits are read from memory onto the data bus and sent to the receivers on the same bidirectional pins used by the data bus transmitters. The receivers send the 16-bit coupler memory word to the DB1 register (A02-3) and to the parity check circuit along with the two parity bits.

PARITY CHECK

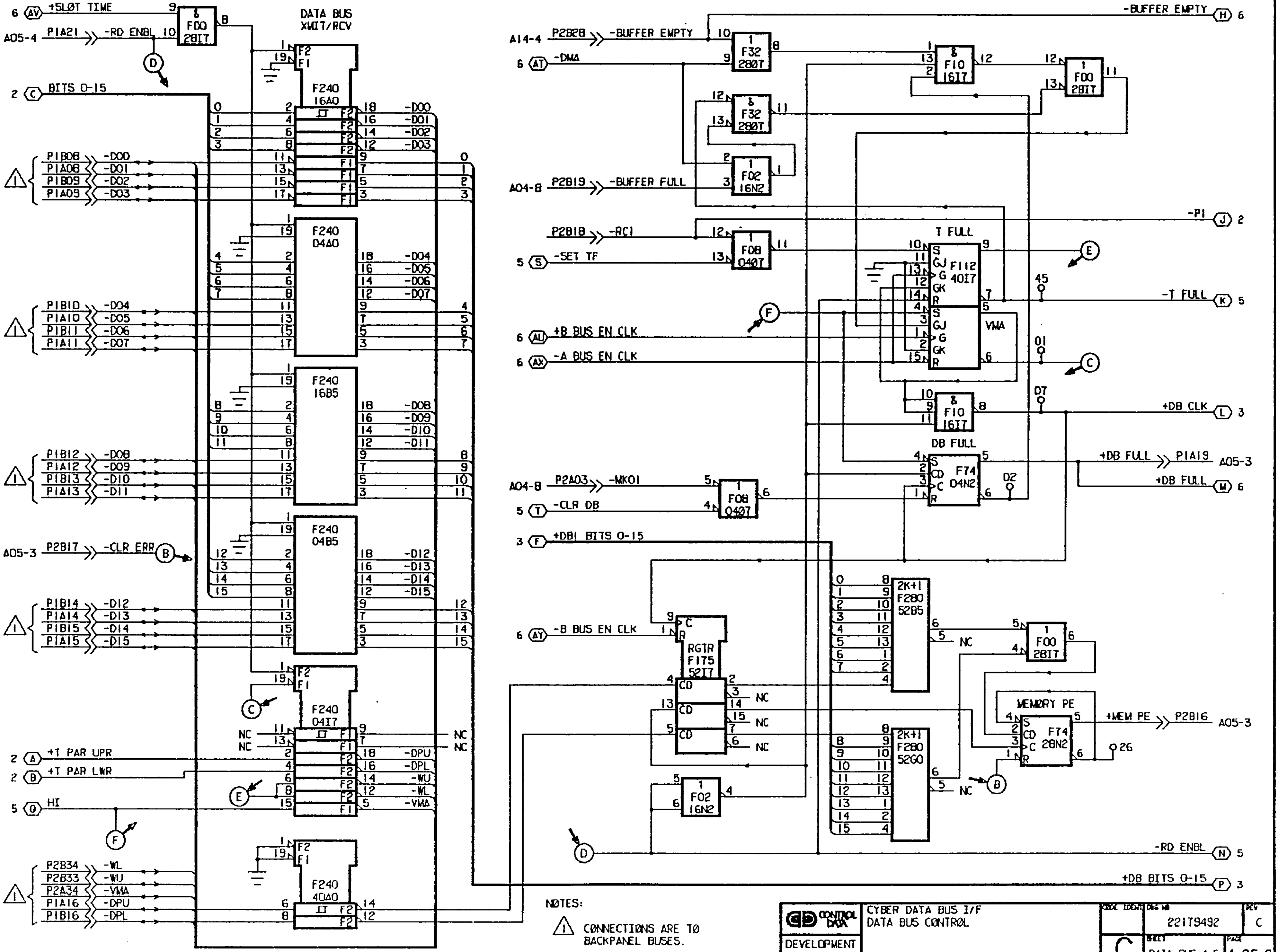
A check for odd parity is performed on the upper and lower 8-bit bytes of the 16-bit coupler memory word from the DB1 register (A02-3) and the associated parity bits from the 520S register. A parity error sets the memory parity FF, and a Mem PE (Memory Parity Error) signal is sent to the control flag register (A05-3).

DATA BUS CONTROL SIGNALS

The valid memory address (VMA) FF enables transfer of memory data during coupler read and write operations.

The DB Full FF and Buffer Empty signal (A14-5) control data transfers during a coupler read operation.

The T Full FF and Buffer Full signal (A14-5) control data transfers during a coupler write operation.



NØTES:

⚠ CØNNECTIØNS ARE TØ BACKPANEL BUSES.

CONTROL DATA

DEVELOPMENT DIVISION

CYBER DATA BUS I/F
DATA BUS CØNTRØL

LØC:A02

DWG NO 22179492

REV C

SIZE C

SHEET DATA BUS 4-F

PAGE 4 OF 6

CYBER INTERFACE - DATA (A02-5)

DATA WRITE CONTROL

This logic provides the signals needed to control data transfers during a coupler write operation. Some signals are also used during coupler read operations.

The outputs of the byte A, B, and C FFs and 9-track/disk R3 upper and lower full FFs on this diagram (A02-5) gate 8-bit data bytes through the 9-track/disk R3 registers (A02-2).

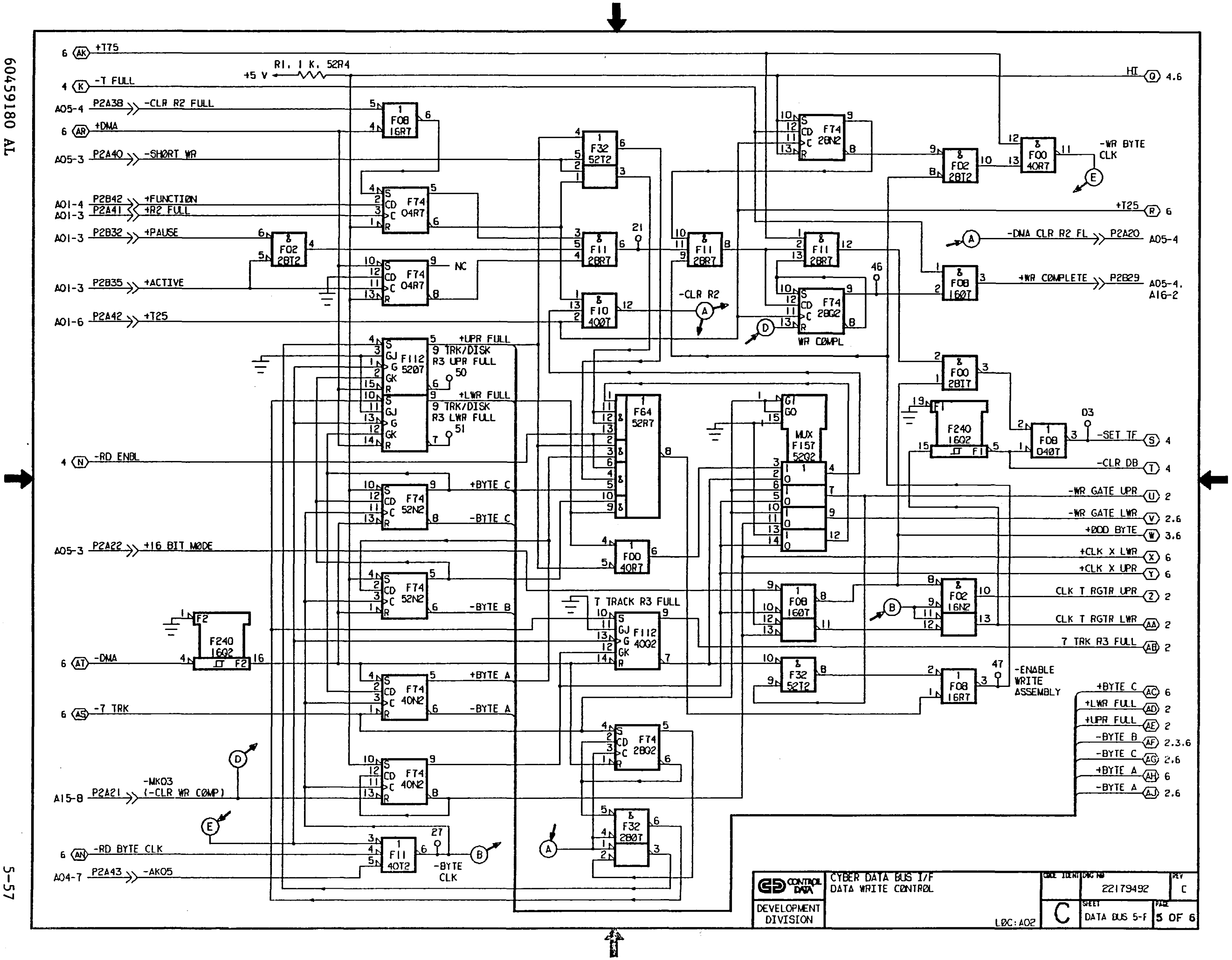
The output of the 7-track R3 full FF and the Write Gate Upper and Write Gate Lower signals gate 8-bit data bytes through the 7-track R3 register (A02-2).

The Clock T Register Upper and Clock T Register Lower signals clock 8-bit data bytes into the DMA T register (A02-2).

The output of the write complete FF informs the CYBER channel interface (A05-4), the FIPS stream logic (A16-2), and the FIPS transfer logic (A14-7) that the write operation is finished.

The outputs of the byte A, B, and C FFs are also sent to the DMA read control circuit (A02-6) for gating 8-bit bytes into the 9-track/disk X1 register.

The Clock X Upper and Clock X Lower signals are used to gate two 8-bit bytes into the 7-track X1 register for DMA read control (A02-6).



CONTROL DATA

DEVELOPMENT DIVISION

CYBER DATA BUS I/F
DATA WRITE CONTROL

LOC:A02

C

DWG NO 22179492

REV C

SHEET DATA BUS 5-F

PAGE 5 OF 6

DMA READ CONTROL

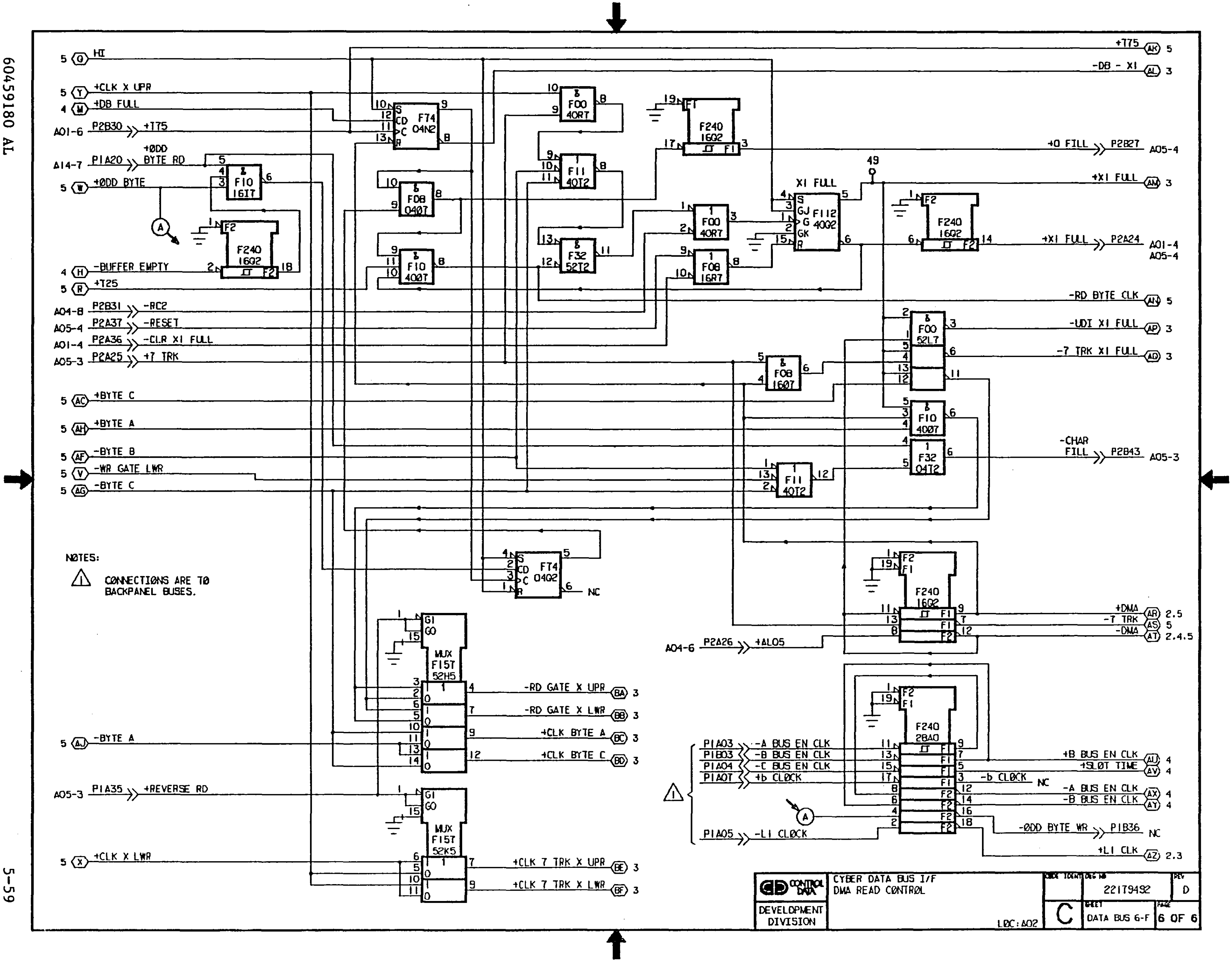
The DMA read control logic provides the signals needed to control data transfers during a DMA read operation.

The output of the X1 full FF enables data to transfer from the UDI, 7-track, or 9-track/disk X1 register (A02-3) to the CYBER channel bus.

The Clock Byte A, and Clock Byte C signals are used to gate data into the 9-track/disk X1 register (A02-3). The Read Gate X Upper and Read Gate X Lower signals gate data from the 9-track/disk X1 register (A02-3), onto the channel bus, to the X2 register (A01-3).

The Clock 7-Track X Upper and Clock 7-Track X Lower signals gate data into the 7-track X1 register (A02-3). The 7-Track X1 Full signal gates data from the 7-track X1 register onto the channel bus, and to the X2 register (A01-3).

The X1 Full signal latches data from the UDI assembly/disassembly register (A04-4) into the UDI X1 register (A02-3). The UDI X1 Full signal gates data from the UDI X1 register onto the channel bus, to the X2 register (A01-3).



CONTROL DATA
DEVELOPMENT DIVISION

CYBER DATA BUS I/F
DMA READ CONTROL

LOC: A02

DWG NO	22179492
REV	D
SIZE	C
SHEET	DATA BUS 6-F
PAGE	6 OF 6

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PAGE									REVISION RECORD					
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A	B	A	A	B	A	B	A	B	CA46483	SEE C.O.	MES	06/85	NZ	NZ
C	C	C	C	C	C	C	C	C	CA48239	ADDED COVER. RE-INTERSHEET	MES	2/26/87	NS	NS
C	C	C	C	C	C	C	C	D	CA48882	NEW PWA NUMBER	KMS	5/11/87	NS	NS

NOTES:

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	R T HENNING	01/85
MFG	B J REILAND	01/85
APVD	R T HENNING	01/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

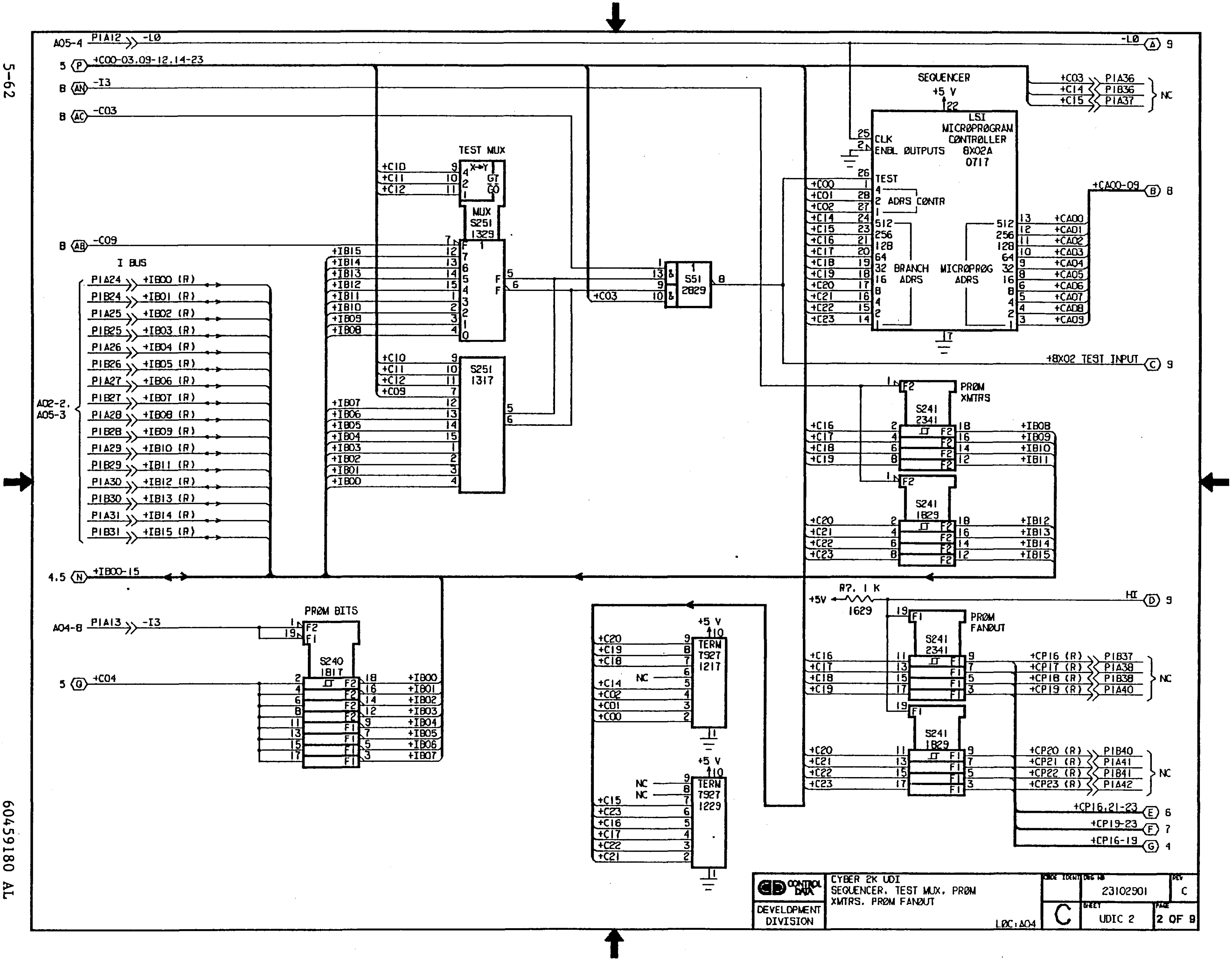
CONTROL DATA

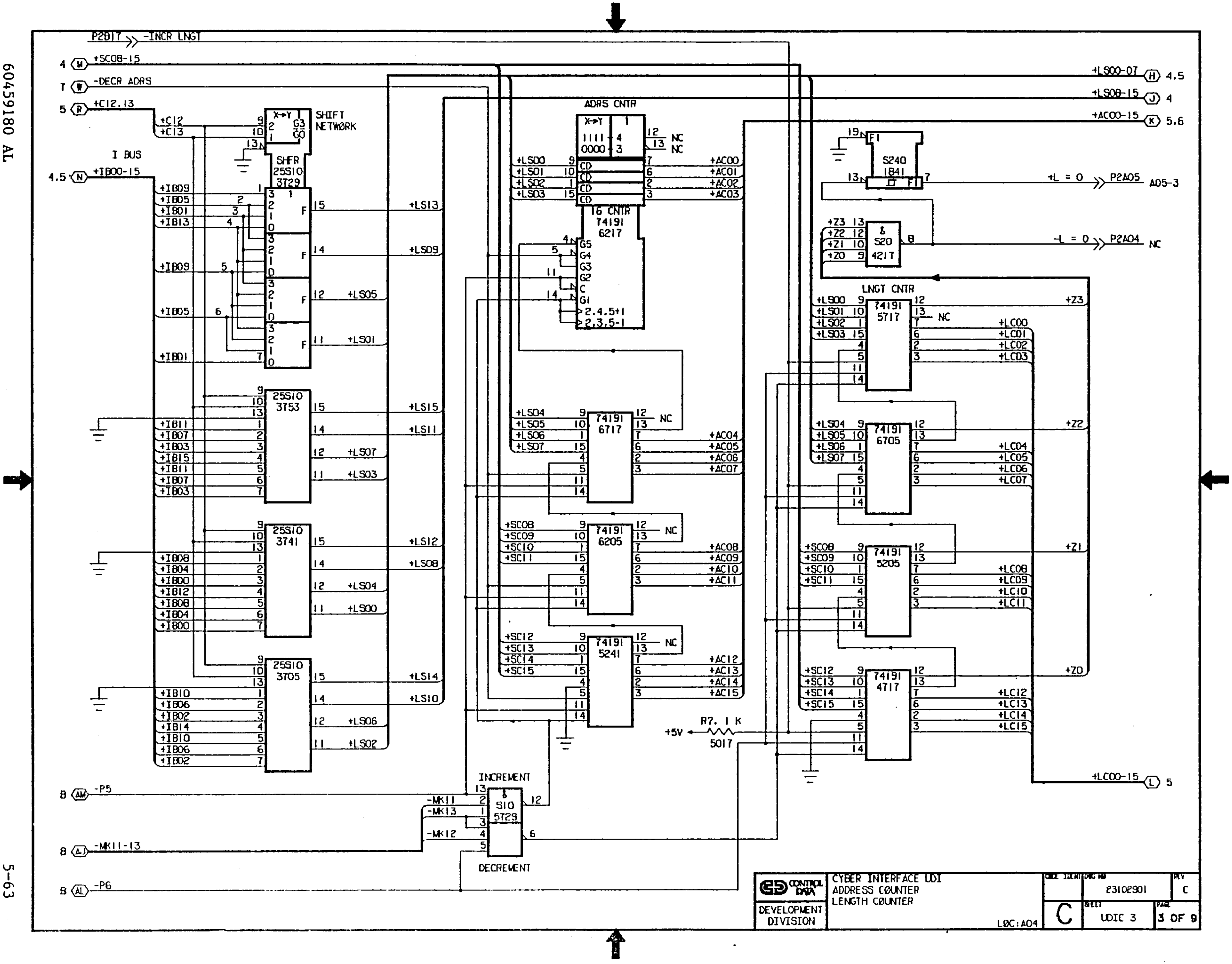
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
CYBER UDI WIRED (2K)

PWA-22136077
PWB-52803444

SIZE C
FSCM NO. 34010
DWG NO. 23102901
LOC: A04
SHEET UDIC 1
PAGE 1 OF 9


A05-4 P1A12 -L0
-L0 A 9
5 P +C00-03,09-12,14-23
8 AN -I3
8 AC -C03
8 AB -C09
SEQUENCER
+5 V
22
LSI
MICROPROGRAM
CONTROLLER
8X02A
0717
25 CLK
2 ENBL OUTPUTS
26 TEST
ADRS CONTR
BRANCH ADRS
MICROPROG ADRS
512 256 128 64 32 16 8 4 2 1
+C00 +C01 +C02 +C14 +C15 +C16 +C17 +C18 +C19 +C20 +C21 +C22 +C23
+CA00 +CA01 +CA02 +CA03 +CA04 +CA05 +CA06 +CA07 +CA08 +CA09
+CA00-09 B 8
+C03 P1A36
+C14 P1B36
+C15 P1A37
NC
+8X02 TEST INPUT C 9
TEST MUX
X→Y
GT
GO
MUX
S251
1329
S251
1317
+C10 +C11 +C12 +C09
+IB15 +IB14 +IB13 +IB12 +IB11 +IB10 +IB09 +IB08
+IB07 +IB06 +IB05 +IB04 +IB03 +IB02 +IB01 +IB00
S51
2829
+C03
I BUS
A02-2,
A05-3
P1A24 +IB00 (R)
P1B24 +IB01 (R)
P1A25 +IB02 (R)
P1B25 +IB03 (R)
P1A26 +IB04 (R)
P1B26 +IB05 (R)
P1A27 +IB06 (R)
P1B27 +IB07 (R)
P1A28 +IB08 (R)
P1B28 +IB09 (R)
P1A29 +IB10 (R)
P1B29 +IB11 (R)
P1A30 +IB12 (R)
P1B30 +IB13 (R)
P1A31 +IB14 (R)
P1B31 +IB15 (R)
4,5 N +IB00-15
PROM
XMTRS
S241
2341
S241
1829
+C16 +C17 +C18 +C19
+IB08 +IB09 +IB10 +IB11
+C20 +C21 +C22 +C23
+IB12 +IB13 +IB14 +IB15
R7, 1 K
+5V
1629
HI D 9
PROM
FANOUT
+CP16 (R) P1B37
+CP17 (R) P1A38
+CP18 (R) P1B38
+CP19 (R) P1A40
+CP20 (R) P1B40
+CP21 (R) P1A41
+CP22 (R) P1B41
+CP23 (R) P1A42
+CP16,21-23 E 6
+CP19-23 F 7
+CP16-19 G 4
PROM BITS
A04-8 P1A13 -I3
S240
1817
5 G +C04
+IB00 +IB01 +IB02 +IB03 +IB04 +IB05 +IB06 +IB07
+5 V
TERM
T927
1217
+C20 +C19 +C18 +C14 +C02 +C01 +C00
TERM
T927
1229
+C15 +C23 +C16 +C17 +C22 +C21
NC
CONTROL DATA
DEVELOPMENT
DIVISION
CYBER 2K UDI
SEQUENCER, TEST MUX, PROM
XMTRS, PROM FANOUT
LOC:A04
CODE IDENT
DWG NO
23102901
REV
C
C
SHEET
UDIC 2
PAGE
2 OF 9



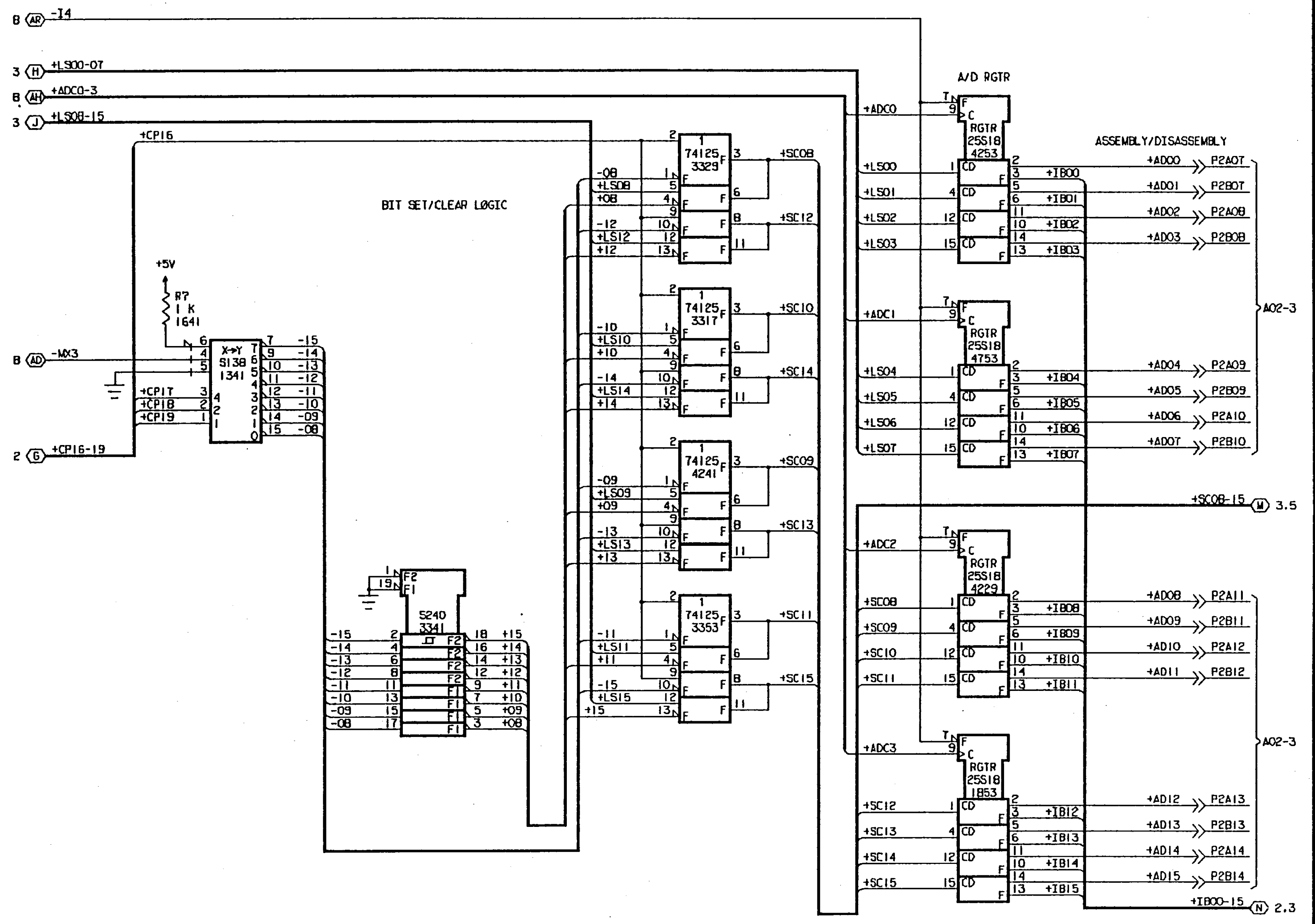
CONTROL DATA

DEVELOPMENT DIVISION

CYBER INTERFACE UDI
ADDRESS COUNTER
LENGTH COUNTER

LOC: A04

CODE IDENT	DWG NO	REV
C	23102901	C
SHEET	UDIC 3	PAGE 3 OF 9



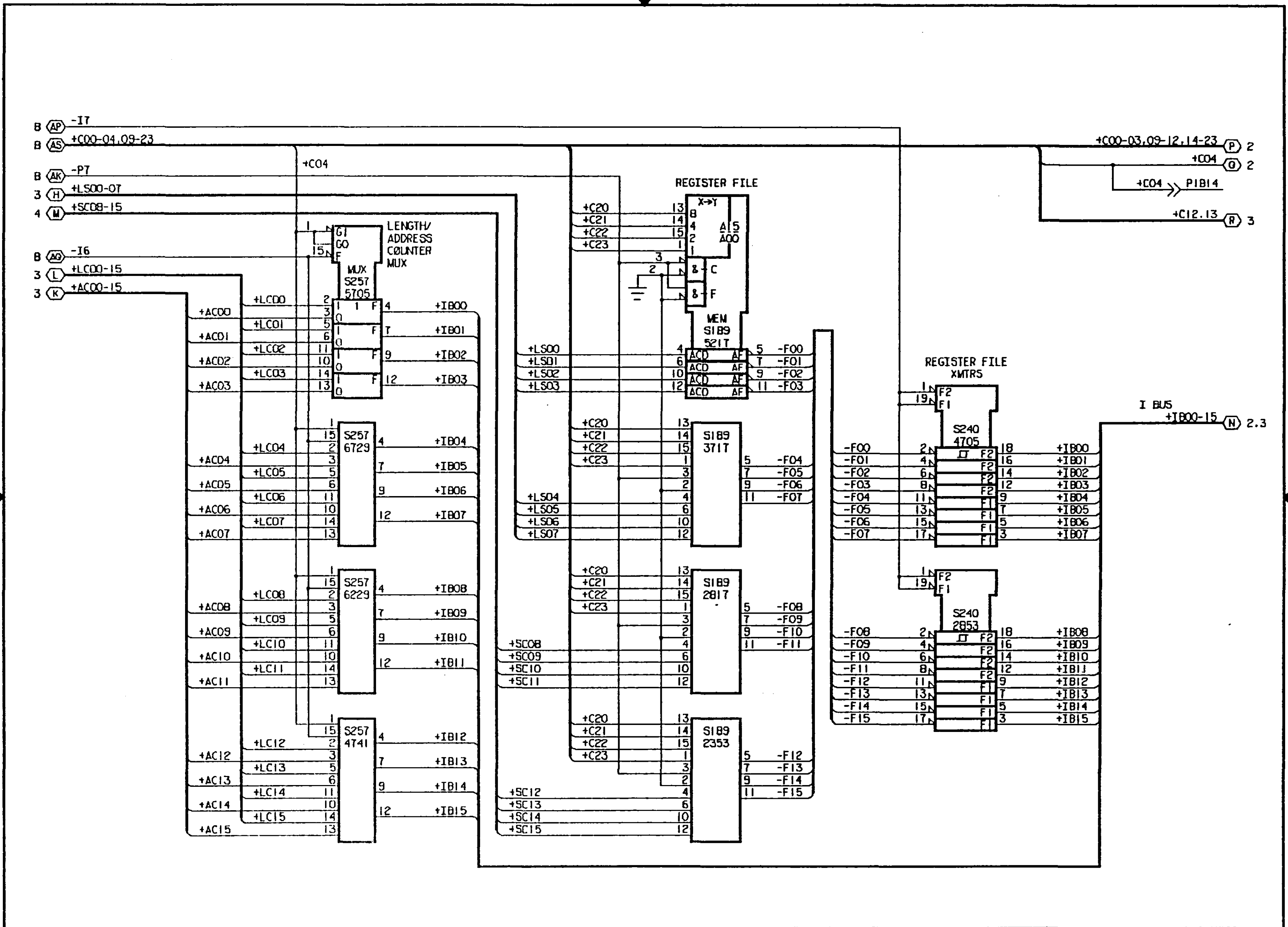
CONTROL DATA

DEVELOPMENT DIVISION

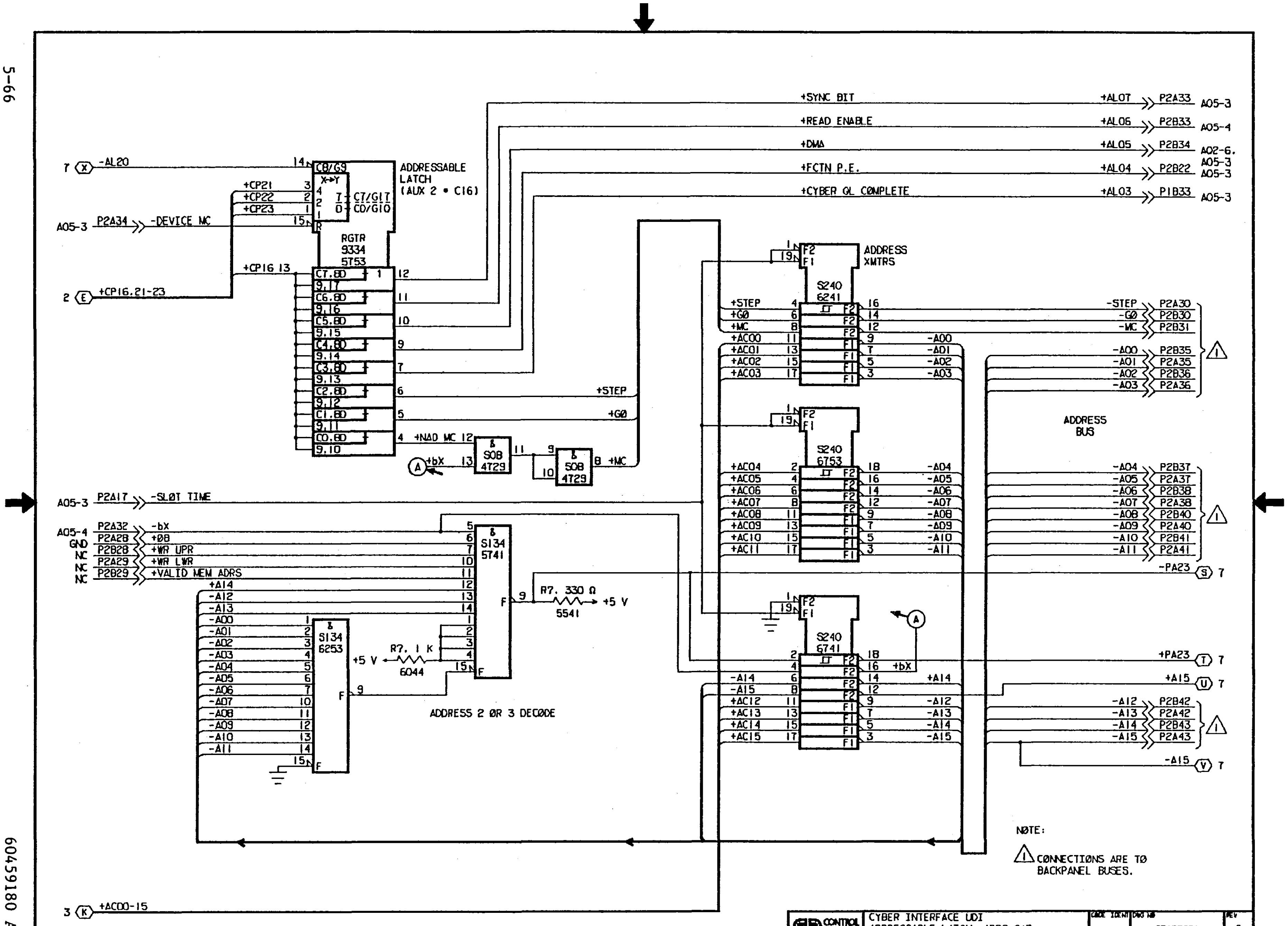
CYBER INTERFACE UDI
BIT SET/CLEAR, ASSEMBLY/
DISASSEMBLY (A/D) RGTR

LOC: A04

CODE IDENT	DWG NO	REV
C	23102501	C
	SHEET UDIC 4	PAGE 4 OF 9



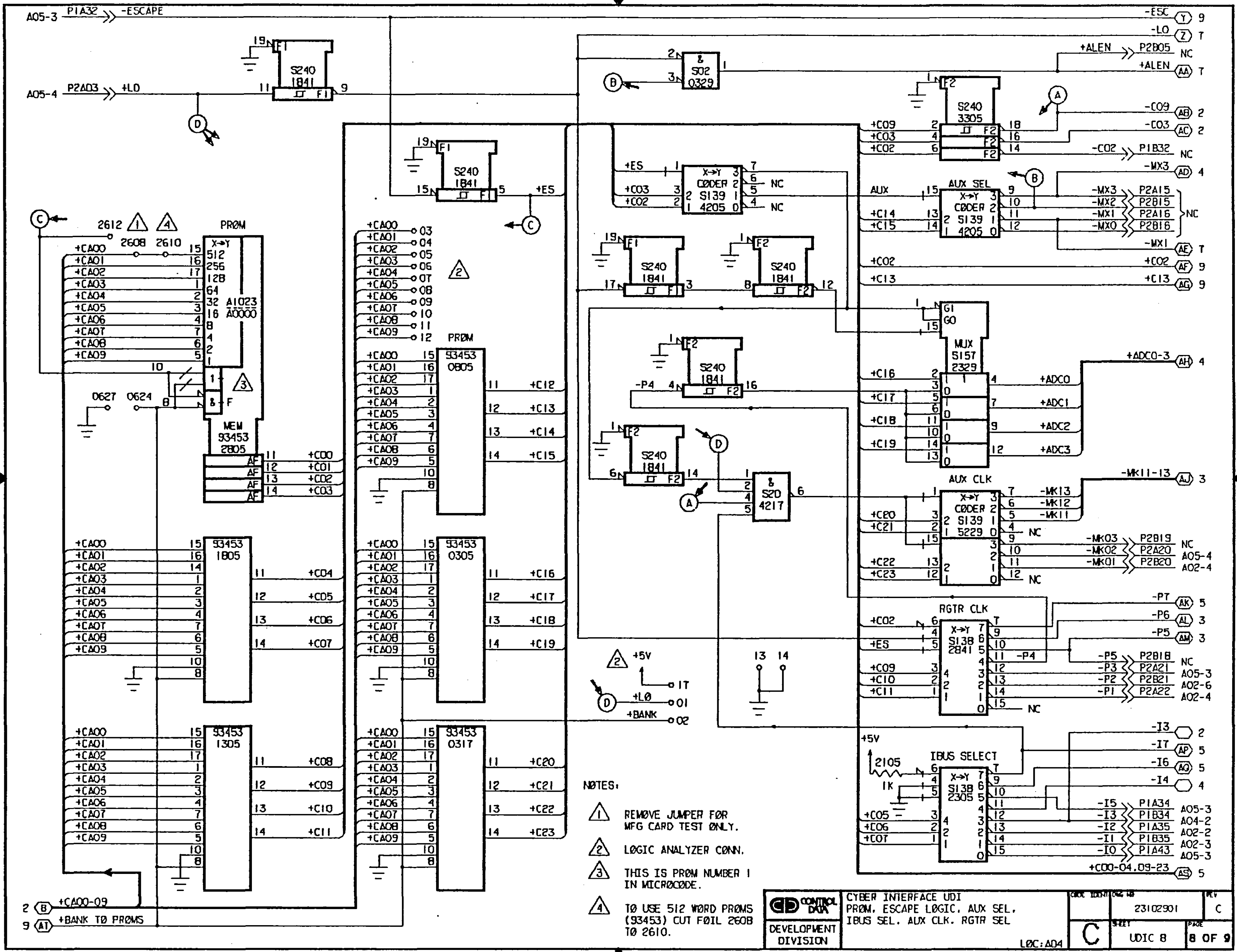
CONTROL DATA	CYBER INTERFACE UDI LENGTH/ADDRESS MUX. REGISTER FILE. REGISTER FILE XMTRS	CODE IDENT	DWG NO 23102901	REV C
DEVELOPMENT DIVISION	LØC:A04	C	SHEET UDIC 5	PAGE 5 OF 9



NOTE:

⚠ CONNECTIONS ARE TO BACKPANEL BUSES.

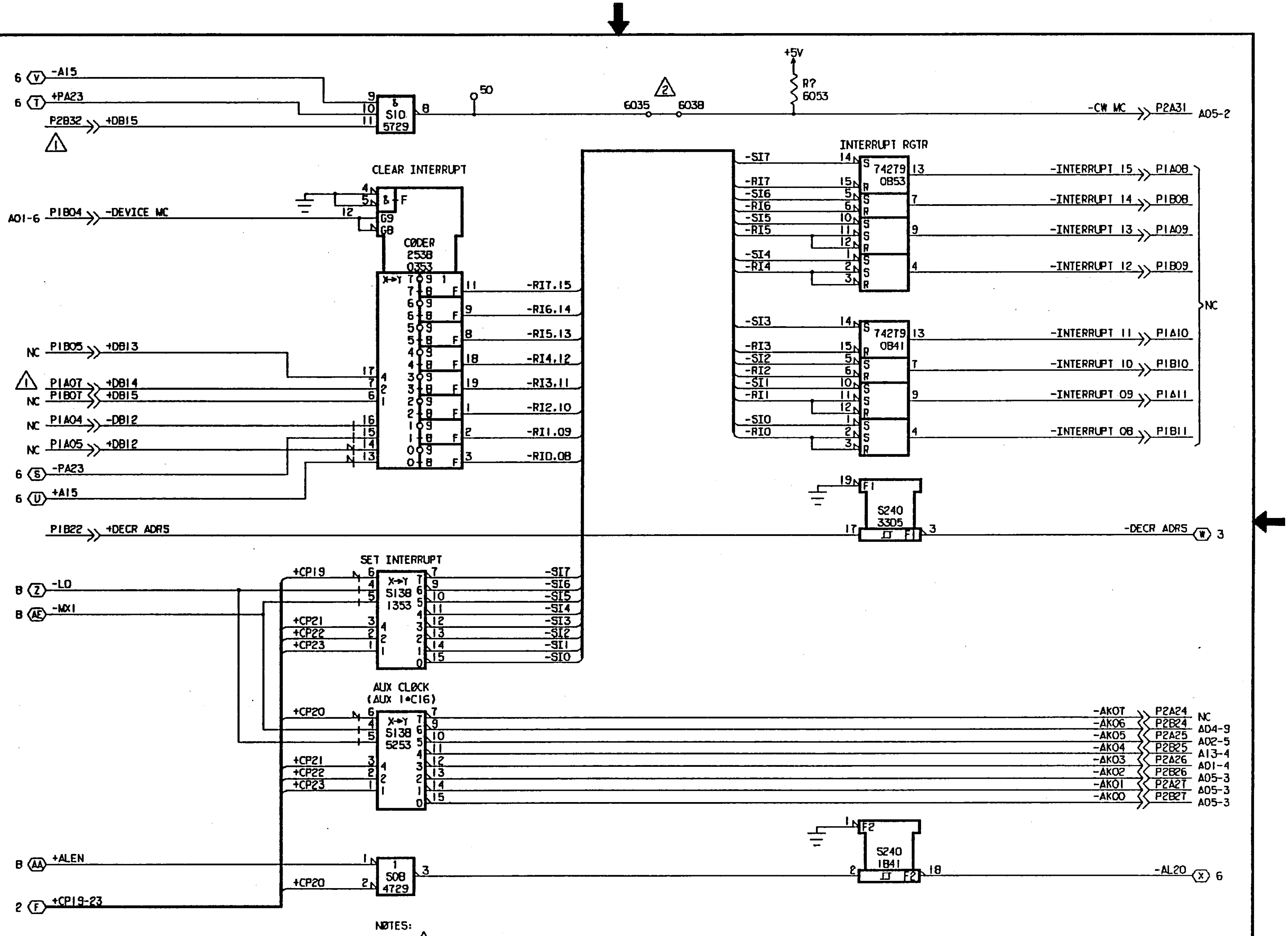
CONTROL DATA DEVELOPMENT DIVISION	CYBER INTERFACE UDI ADDRESSABLE LATCH, ADRS 2/3 DECODE, ADDRESS XMTRS LOC: A04	SIZE C	CODE IDENT	DWG NO 23102901	REV C
			SHEET UDIC 6	PAGE 6 OF 9	



NOTES:

1. REMOVE JUMPER FOR MFG CARD TEST ONLY.
2. LOGIC ANALYZER CONN.
3. THIS IS PROM NUMBER 1 IN MICROCODE.
4. TO USE 512 WORD PROMS (93453) CUT FOIL 2608 TO 2610.

CONTROL DATA DEVELOPMENT DIVISION	CYBER INTERFACE UDI PROM, ESCAPE LOGIC, AUX SEL, IBUS SEL, AUX CLK, RGTR SEL LOC:A04	C	DWG NO 23102901 SHEET UDIC 8	REV C PAGE 8 OF 9



NOTES:

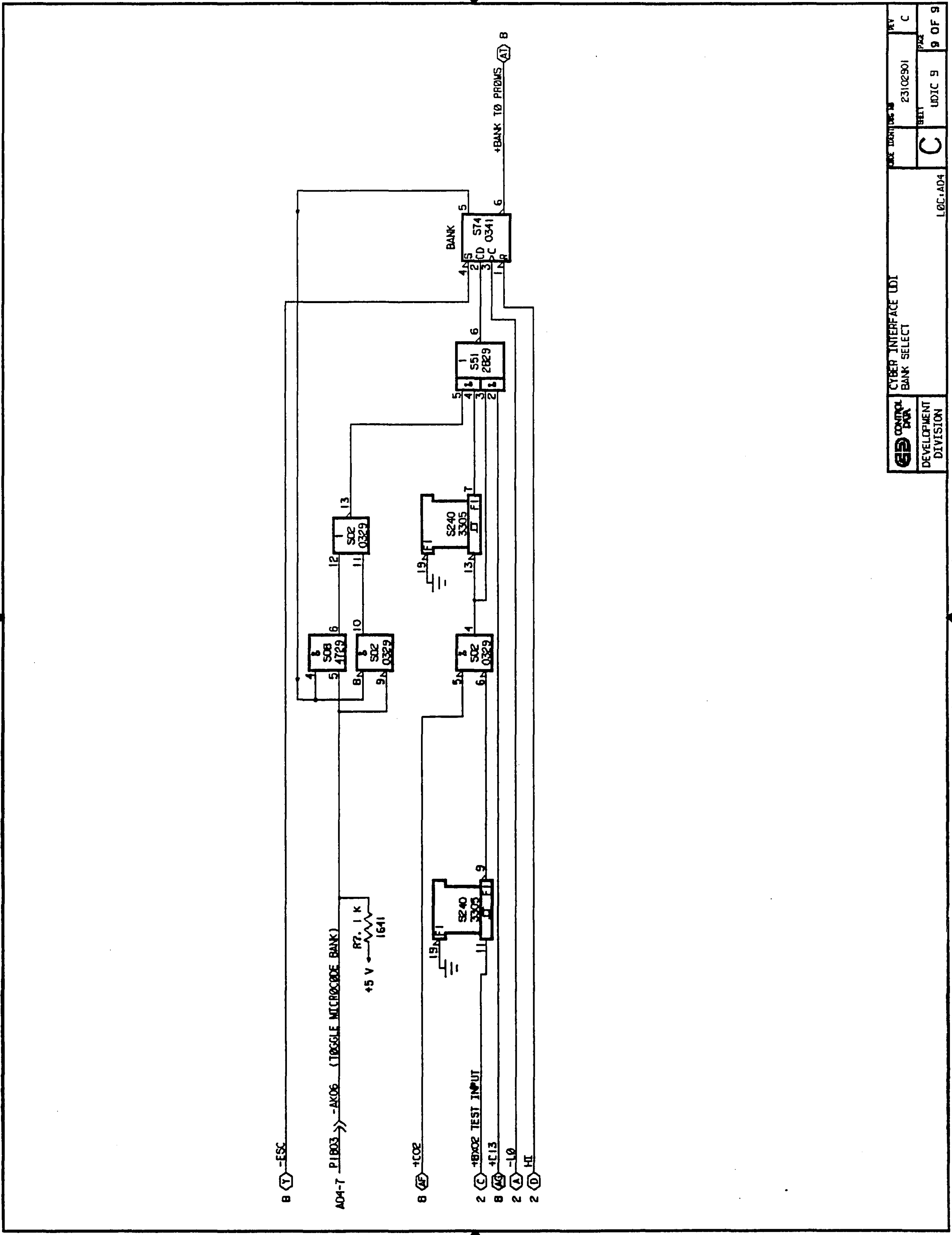
1. P2B32 AND P1A07 ARE TIED TOGETHER ON THE BACKPANEL.
2. REMOVE JUMPER FOR MFG CARD TEST ONLY.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER INTERFACE UDI
SET/CLR INTERRUPTS,
INTERRUPT RGTR. AUX CLOCK

LOC: A04

CODE IDENT	DWG NO	REV
	23102901	C
C	SHEET UDIC 7	PAGE 7 OF 9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A04-7 P1B03 -AK06 (TOGGLE MICROCODE BANK)
B AF +CO2
2 C +BXO2 TEST INPUT
B AG +C13
2 A -L0
2 D HI
R7. 1 K
+5 V
1641
S240 3305
S08 4729
S02 0329
S51 2829
BANK
S74 0341
+BANK TO PROMS
AI B
CONTROL DATA
DEVELOPMENT DIVISION
CYBER INTERFACE (UD)
BANK SELECT
23102901
C
UDIC 9
9 OF 9
LOC:A04

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PAGE									REVISION RECORD					
9	8	7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
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B	B	B	B	B	B	B	B	B	CA48097	INACTIVE. FOR SERVICE USE ONLY SUPERSEDED BY DWG. 22110161	MES	8/12/86	NS	NS
C	C	C	C	C	C	C	C	C	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/25/87	NS	NS
C	C	C	C	C	C	C	C	D	CA48882	NEW PWA NUMBER	KMS	5/11/87	NS	NS

NOTES:

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE PLACE ANGLES
MATERIAL
FINISH

DWN	M E SCHMIDT	12/84
CHKD	N ZAK	12/84
ENGR	L B ULFIG	2/22/85
MFG	B J REILAND	2/22/85
APVD	L B ULFIG	2/22/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

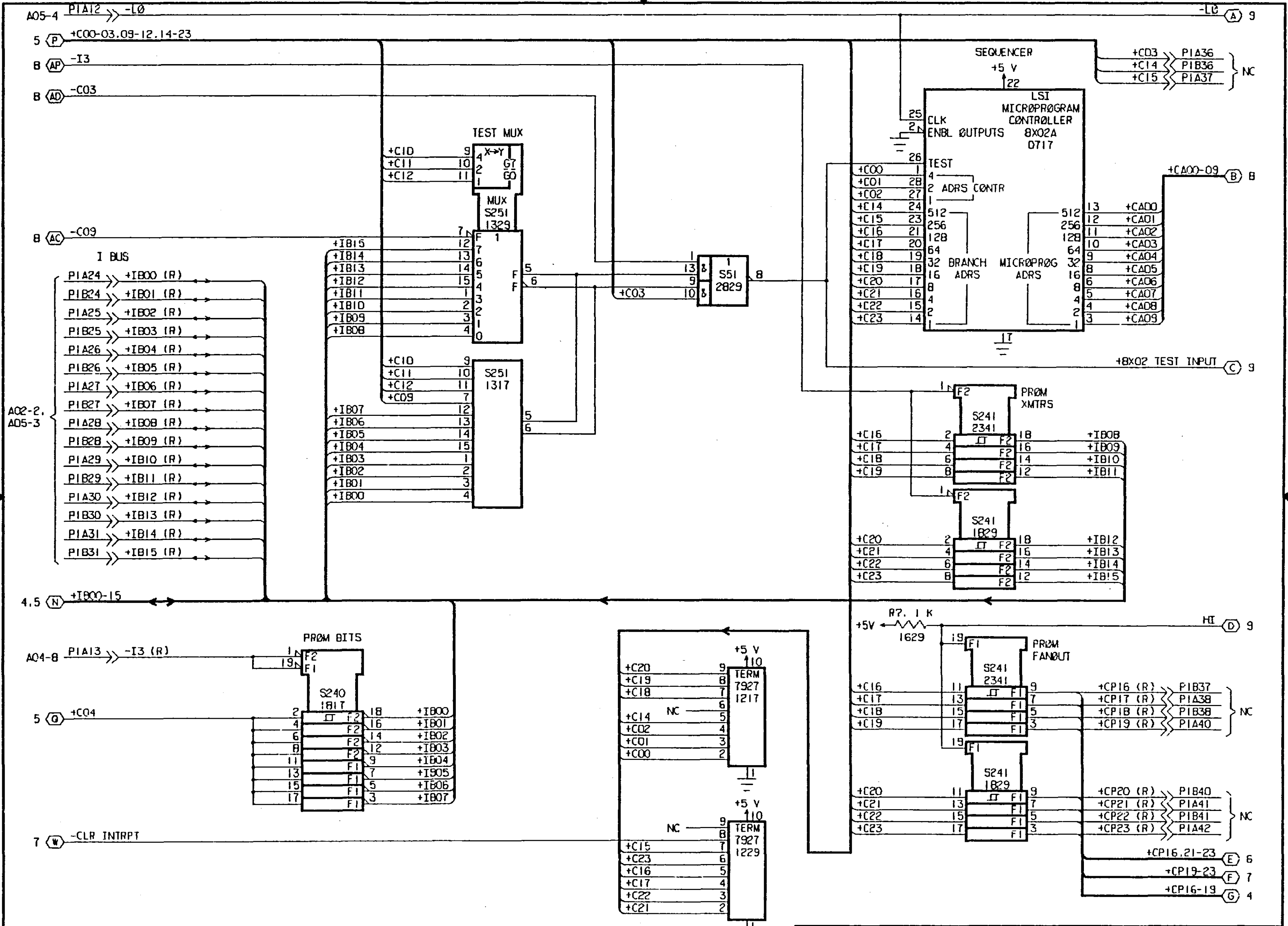
TITLE

LOGIC DIAGRAM
CYBER 2K UDI

PWA-22136078 PWB-67046086

SIZE C FSCM NO. 34010 DWG NO. 23102903

LOC: A04 SHEET UDIC 2K-1 PAGE 1 OF 9



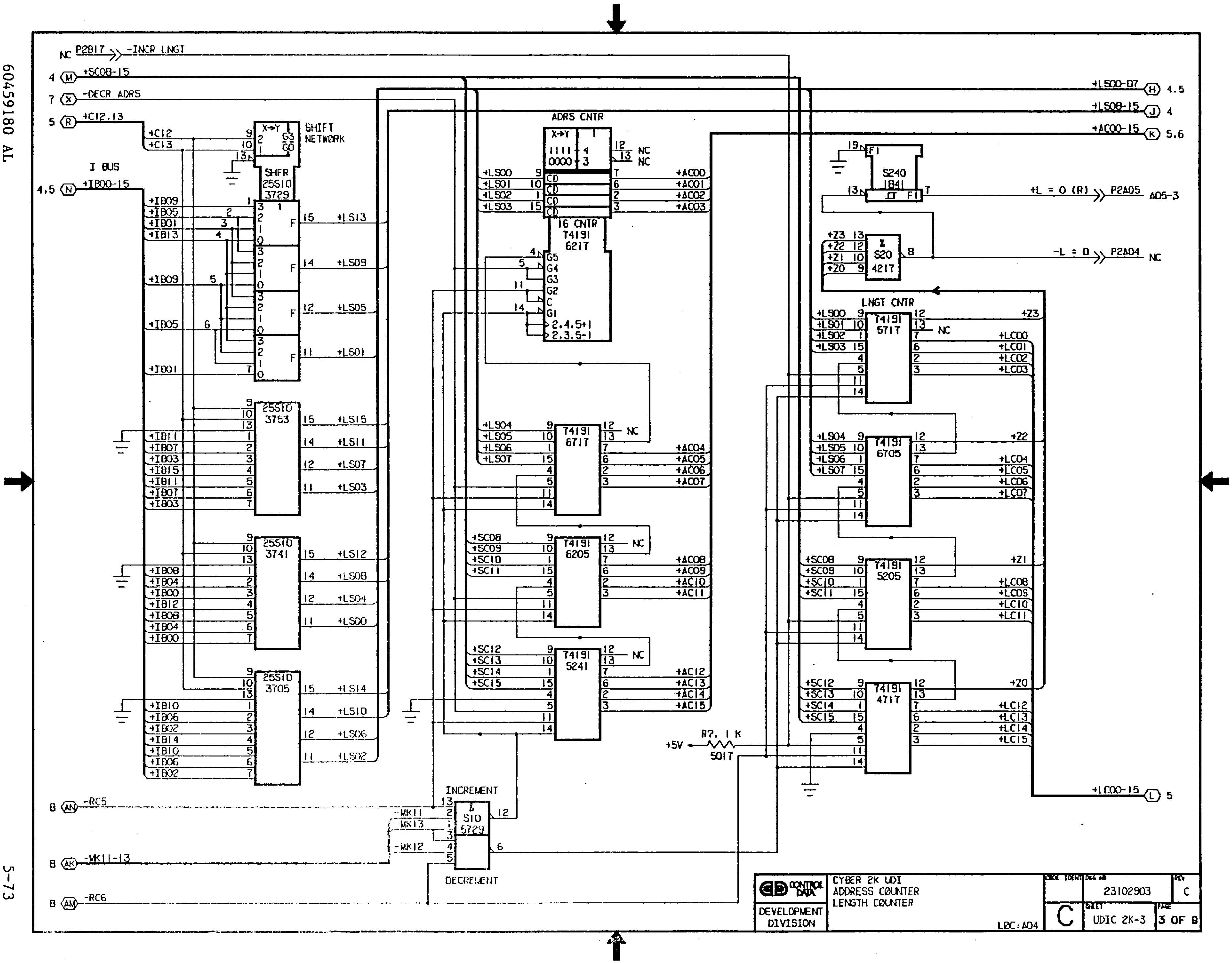
CONTROL DATA

DEVELOPMENT DIVISION

CYBER 2K UDI
SEQUENCER, TEST MUX, PROM
XMTRS, PROM FANOUT

LOC: A04

CODE IDENT	DWG NO	REV
C	23102903	C
	SHEET UDIC 2K-2	PAGE 2 OF 9



CONTROL DATA

DEVELOPMENT DIVISION

CYBER 2K UDI
ADDRESS COUNTER
LENGTH COUNTER

LOC:A04

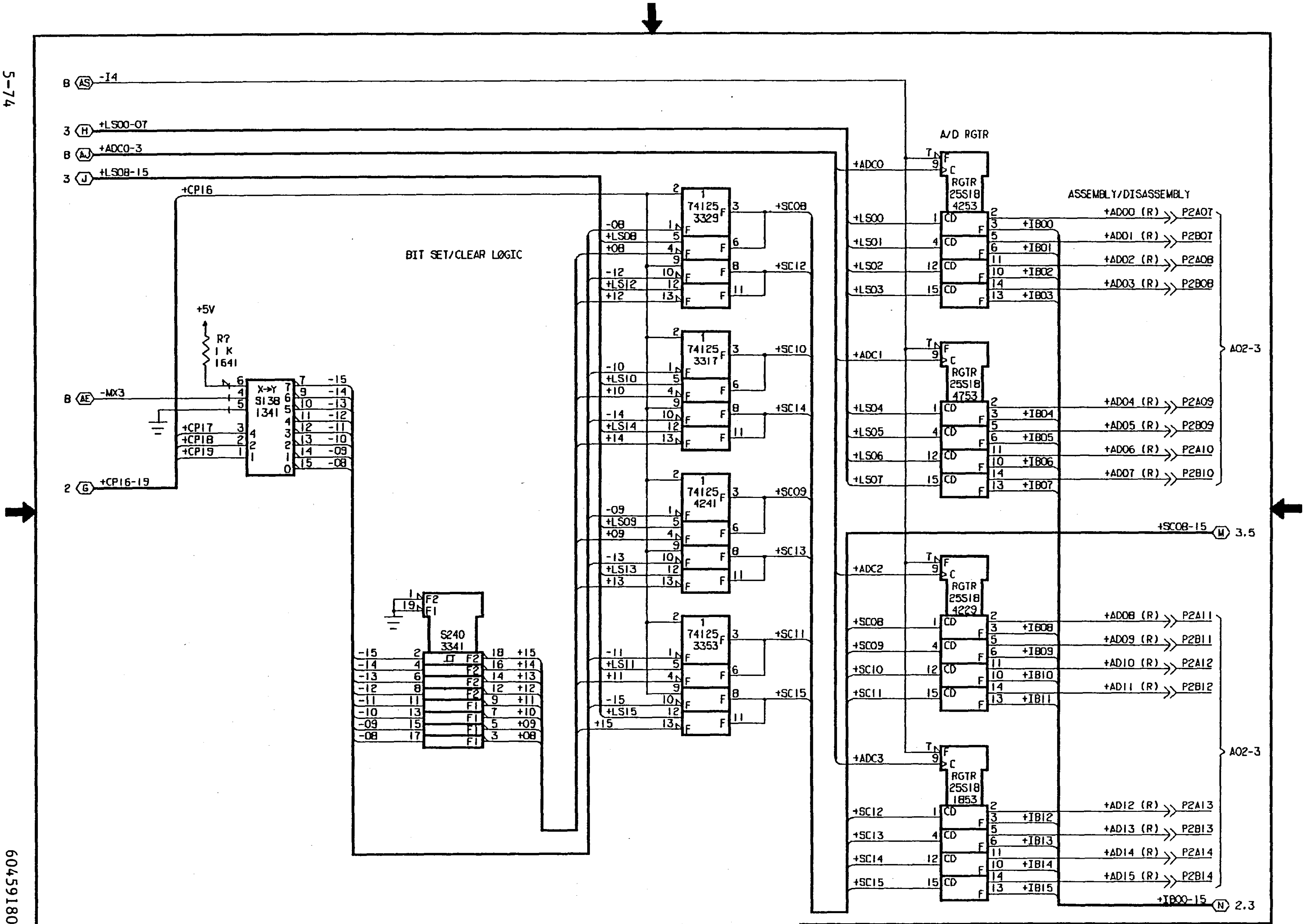
C

23102903

REV C

UDIC 2K-3

3 OF 8



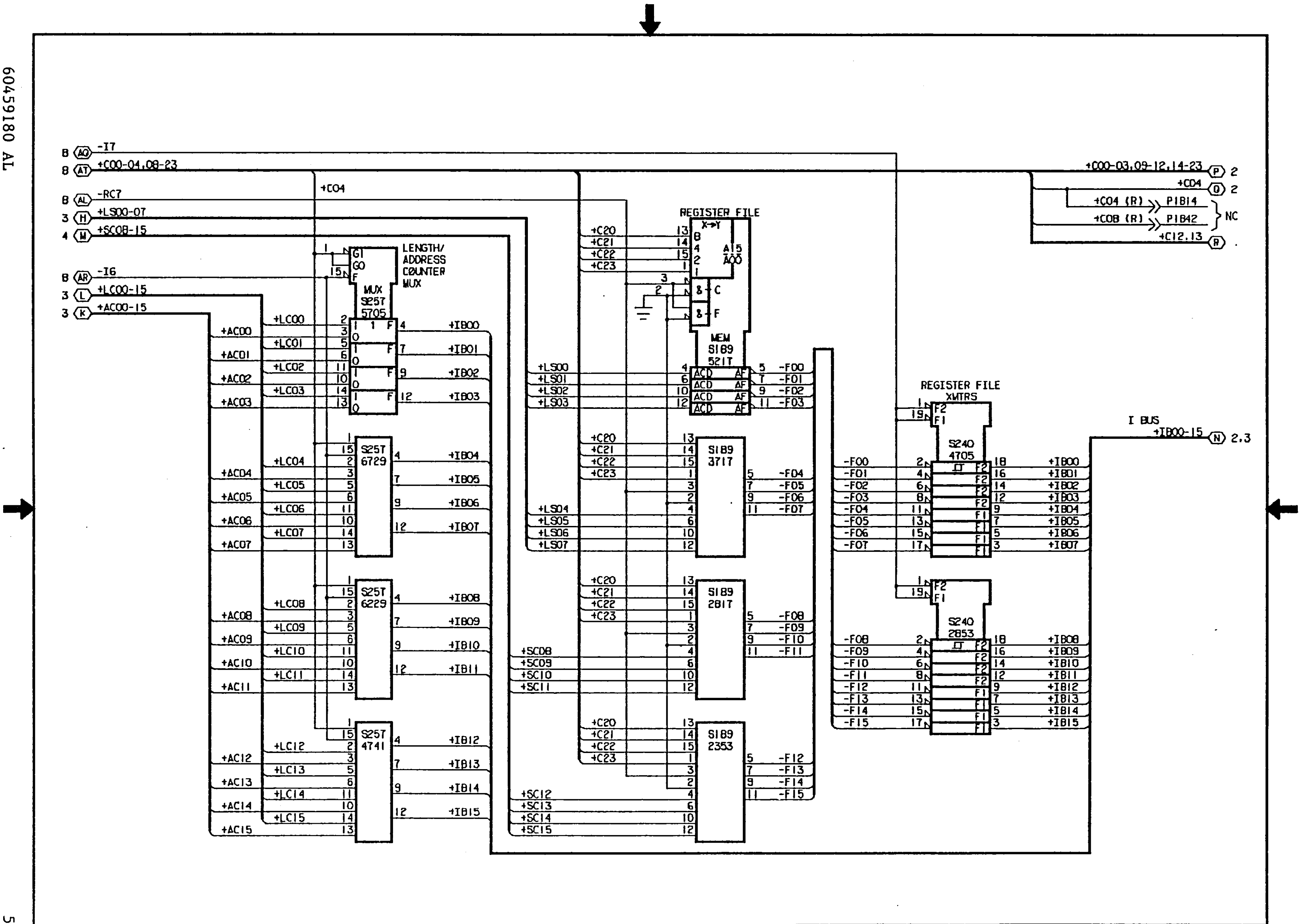
CONTROL DATA

DEVELOPMENT DIVISION

CYBER 2K UDI
BIT SET/CLEAR, ASSEMBLY/
DISASSEMBLY (A/D) RGTR

LOC:A04

CODE IDENT	DWG NO	REV
C	23102903	C
	SHEET UDIC 2K-4	PAGE 4 OF 9



CONTROL DATA

DEVELOPMENT DIVISION

CYBER 2K UDI
LENGTH/ADDRESS MUX, REGISTER
FILE, REGISTER FILE XMTRS

LOC:A04

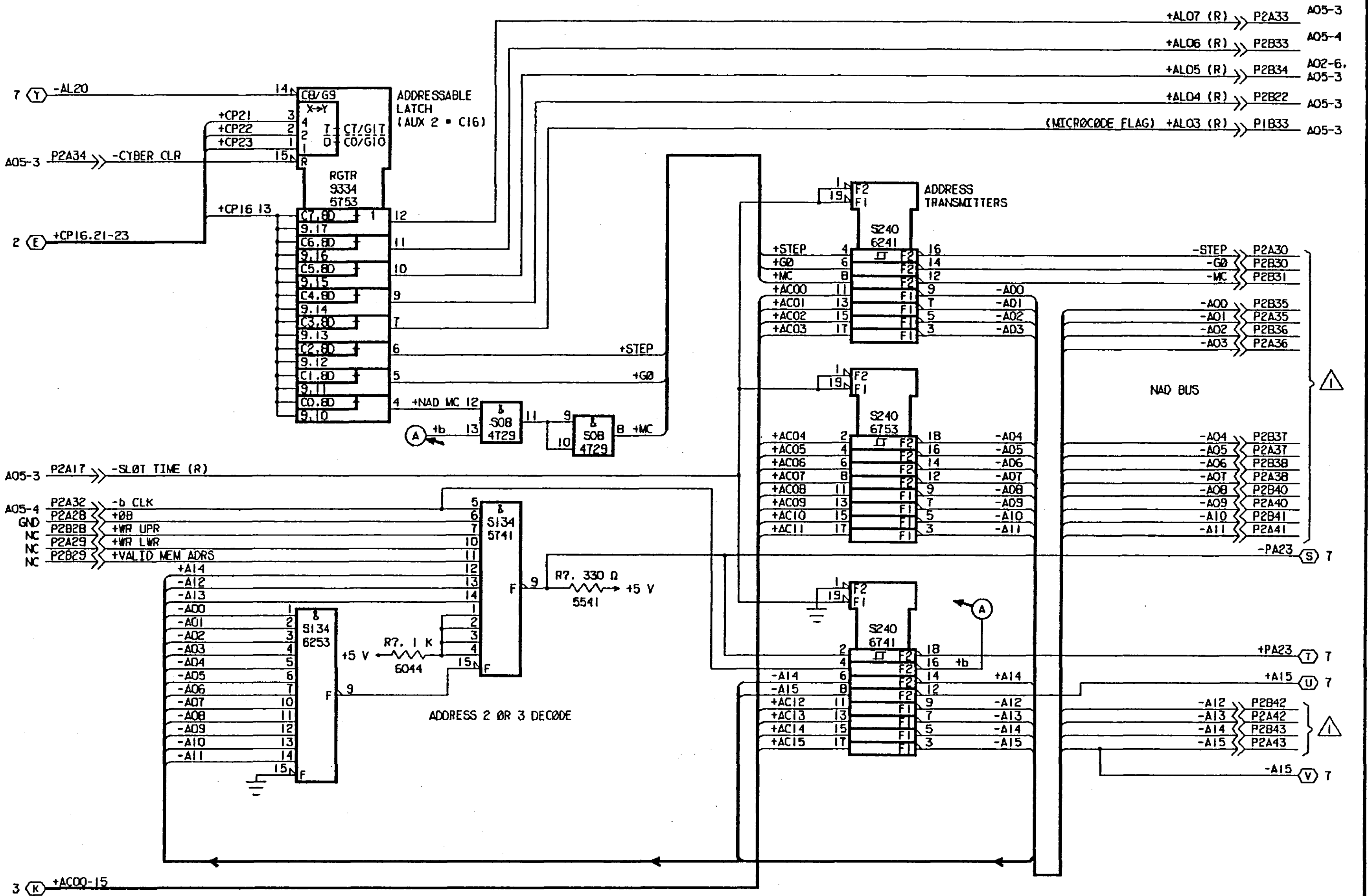
C

23102903

C

UDIC 2K-5

5 OF 9



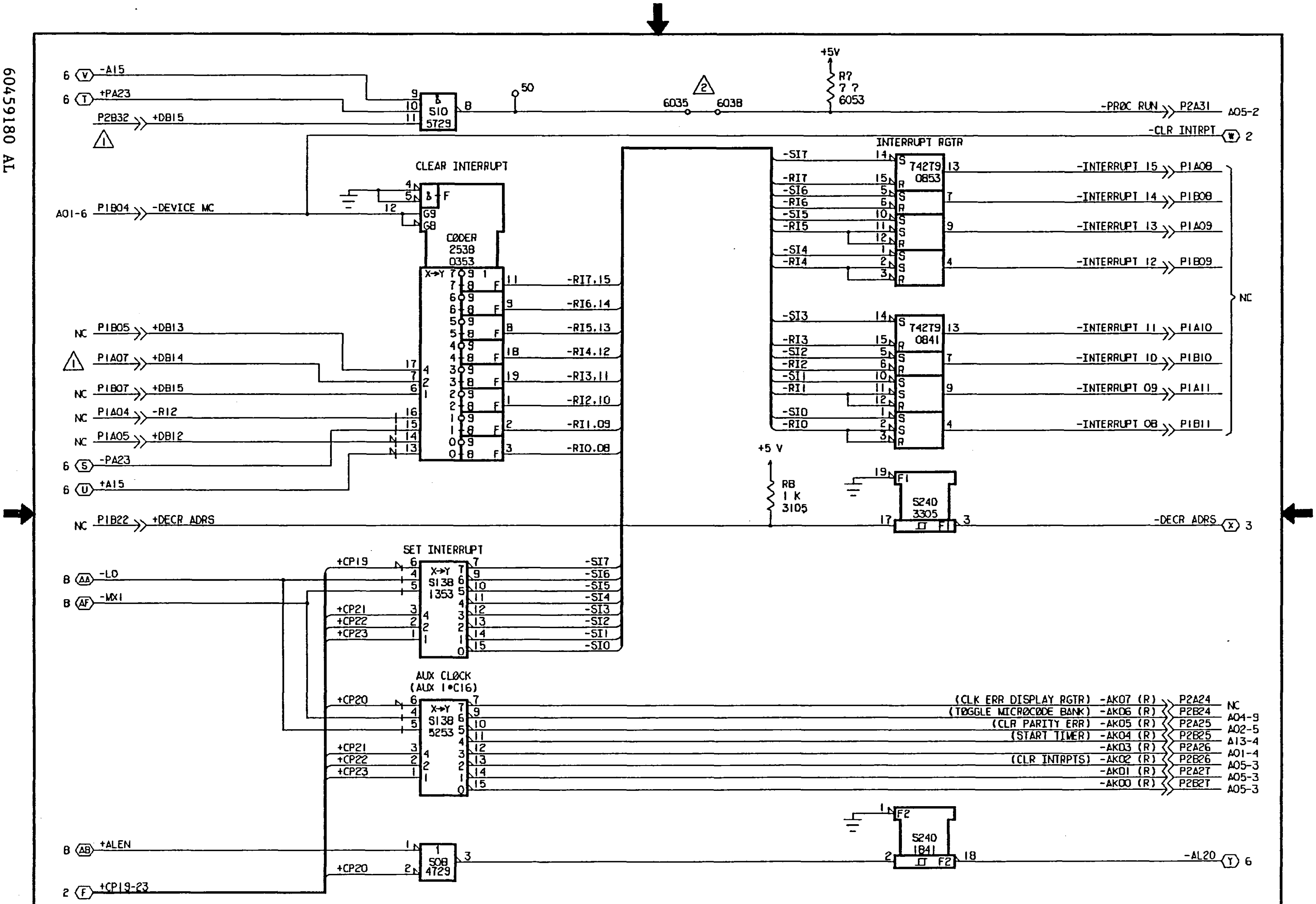
NOTES:

⚠ CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI
ADDRESSABLE LATCH, ADDR 2/3
DECODE, ADDRESS TRANSMITTERS
LOC:A04

CODE IDENT	DWG NO	REV
C	23102903	C
	SHEET UDIC 2K-6	PAGE 6 OF 9



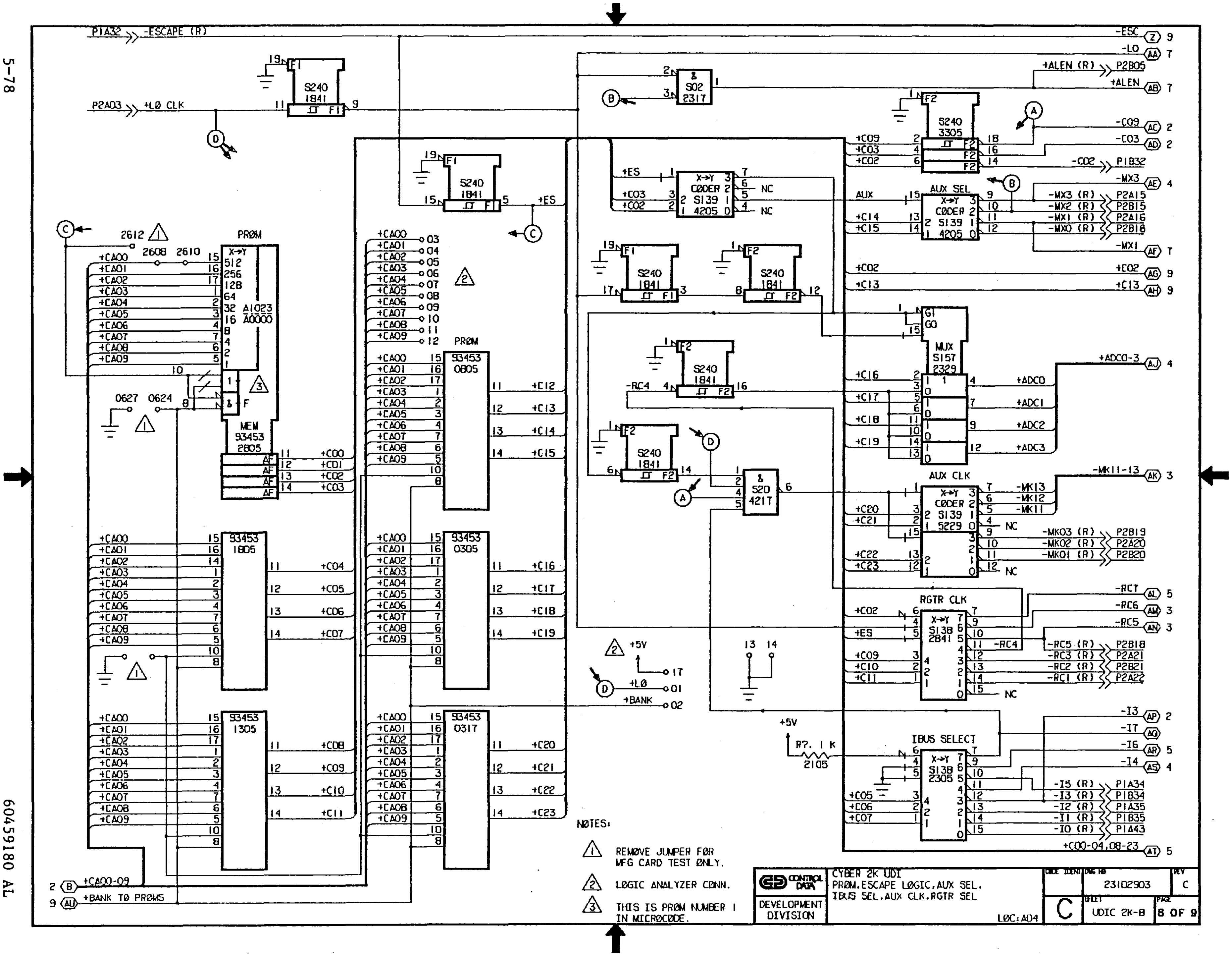
NOTES:

1. P2B32 AND P1A07 ARE TIED TOGETHER ON THE BACKPANEL.
2. REMOVE JUMPER FOR MFG CARD TEST ONLY.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI
SET/CLR INTERRUPTS,
INTERRUPT RGTR, AUX CLOCK
LOC:A04

CODE IDENT	DWG NO	REV
C	23102903	C
SHEET	UDIC 2K-7	PAGE 7 OF 9



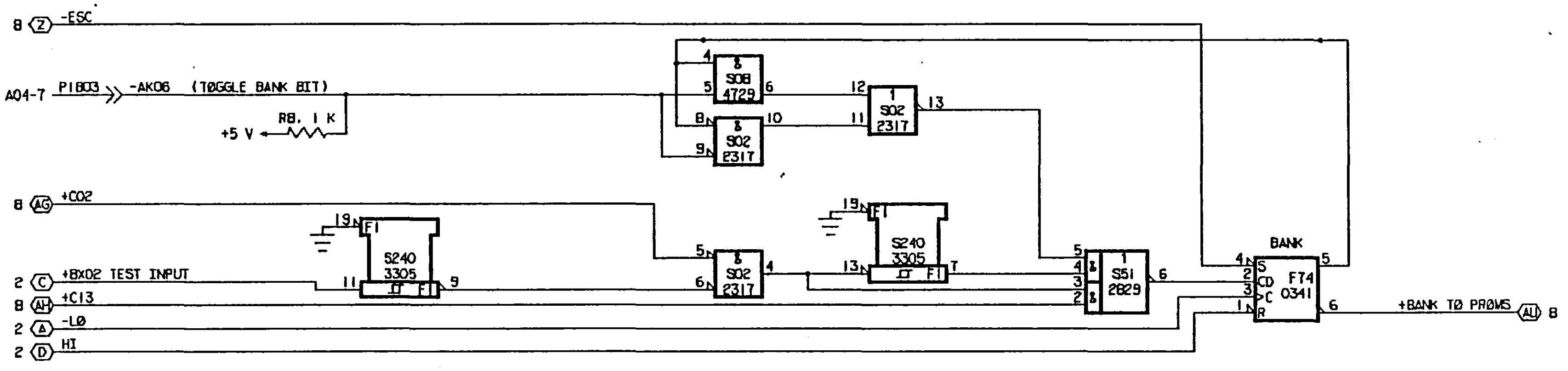
NOTES:

1. REMOVE JUMPER FOR MFG CARD TEST ONLY.
2. LOGIC ANALYZER CONN.
3. THIS IS PROM NUMBER 1 IN MICROCODE.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI
PROM, ESCAPE LOGIC, AUX SEL,
IBUS SEL, AUX CLK, RGTR SEL
LOC: AD4

CODE IDENT
DWG NO 23102903
REV C
C
SHEET UDIC 2K-8
PAGE 8 OF 9



CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI

LØC:A04

CODE IDENT	DWG NO	REV
C	23102903	C
	SHEET: UDIC 2K-9	PAGE: 9 OF 9

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PAGE									REVISION RECORD					
9	8	7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A	A	A	CA48097	CLASS A RELEASE	MES	8/12/86	NS	NS
B	B	B	B	B	B	B	B	B	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/22/87	NS	NS
B	B	B	B	B	B	B	B	C	CA48882	NEW PWA NUMBER	KMS	5/11/87	NS	NS
B	B	B	B	B	B	B	B	D	CA49315	NEW PWA NUMBER	KMS	3/21/88	KS	KS

NOTES:

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2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.
4. THE CHIP IDENTIFIERS ON PWA-22110341 WERE CHANGED TO 'F' TYPE CHIPS. UNLESS OTHERWISE NOTED. EXAMPLE - 'F74' ON PWA-22110341 IS 'S74' ON PWA-53590826.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	08/86
CHKD	N SAMPSON	08/86
ENGR	L B ULFIG	08/86
MFG	R J REILAND	08/86
APVD	L B ULFIG	08/86

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

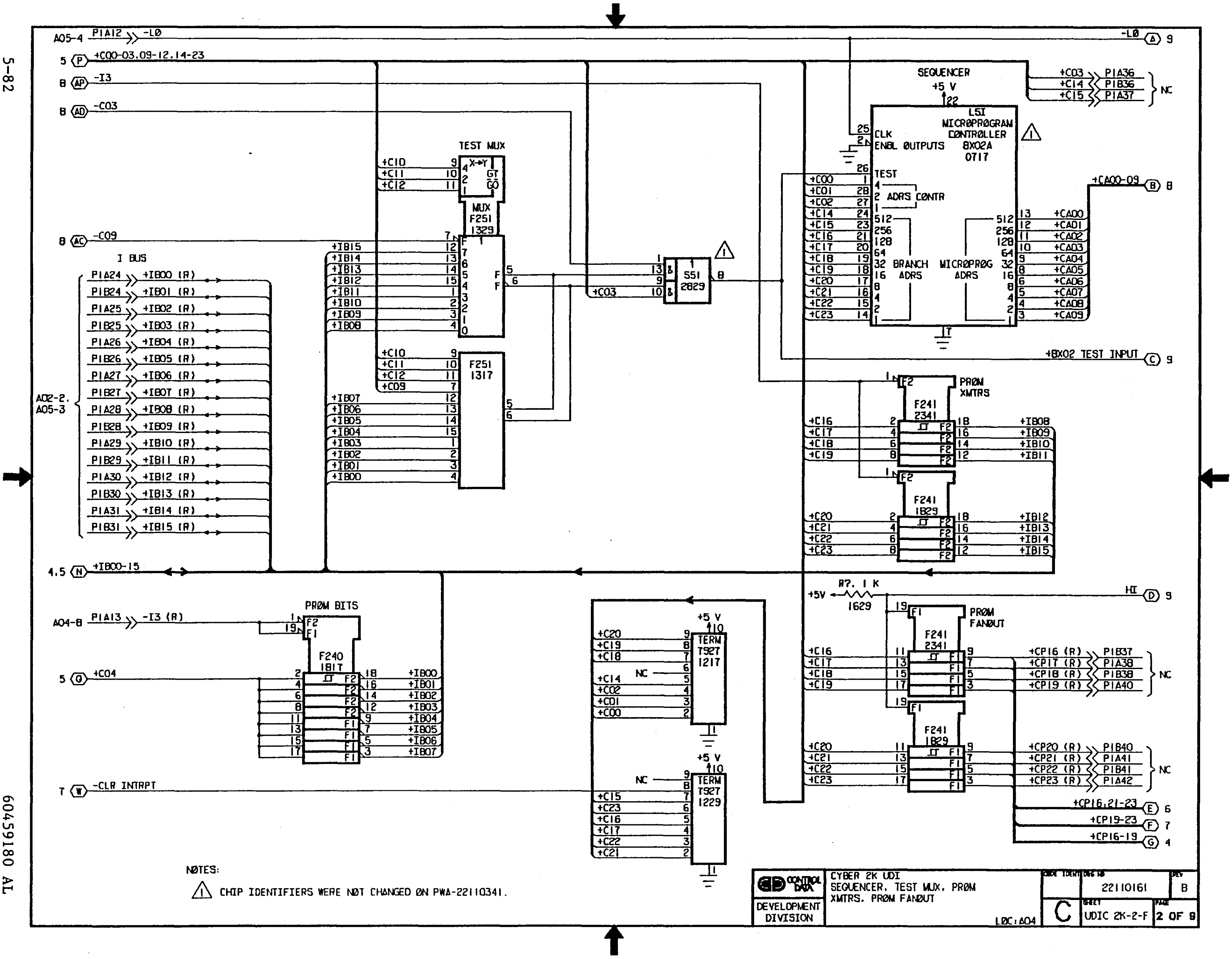
TITLE
LOGIC DIAGRAM CYBER 2K UDI

PWA-10284351
PWB-67046086

SIZE C
FSCM NO. 34010
DWG NO. 22110161
LOC: A04
SHEET UDIC 2K-1-F
PAGE 1 OF 9

CALMA

CSIZECOVER2



NOTES:

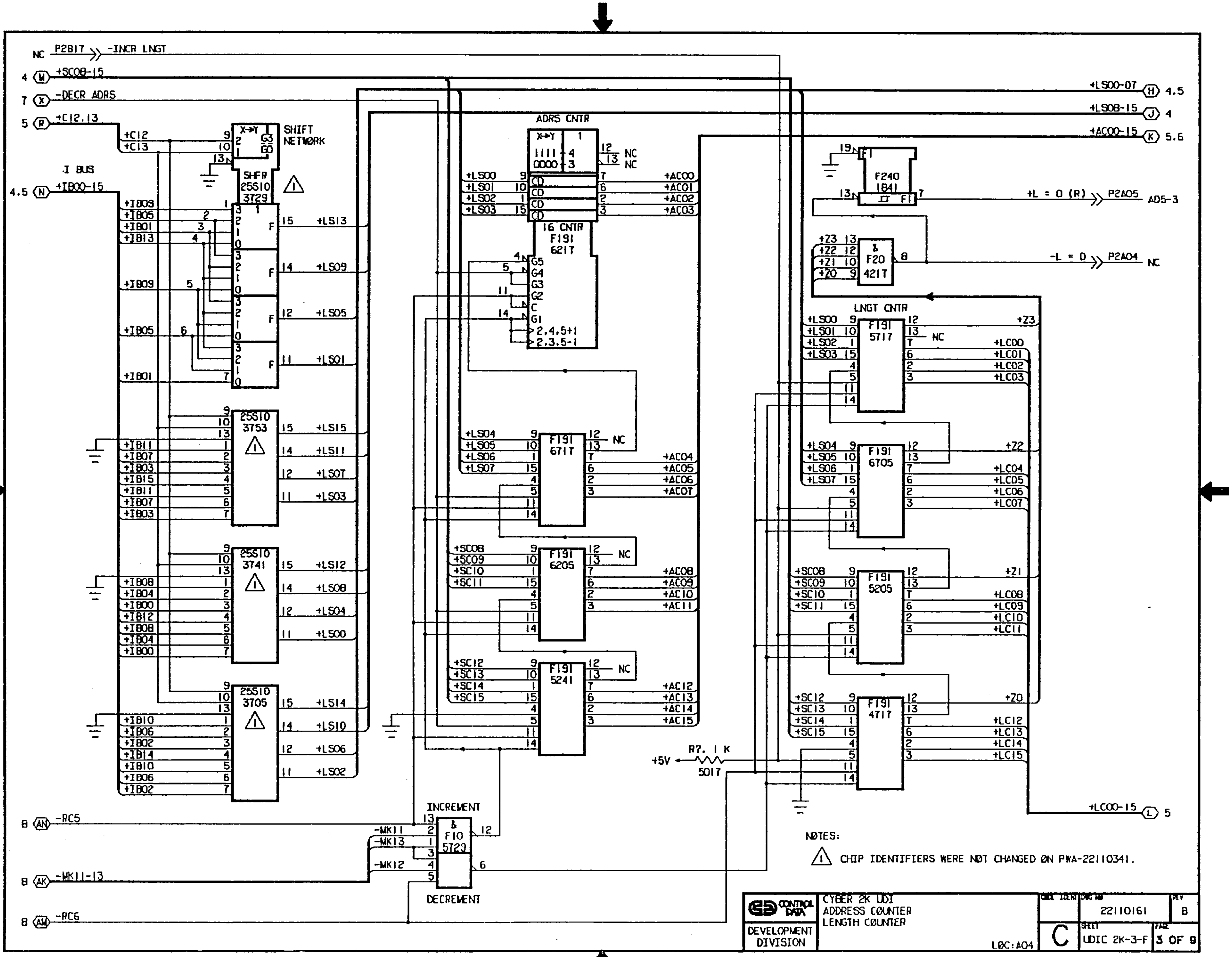
1. CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110341.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI
SEQUENCER, TEST MUX, PROM XMTRS, PROM FANOUT

LOC: A04

CODE IDENT	DWG NO	REV
C	22110161	B
	SHEET UDIC 2K-2-F	PAGE 2 OF 8



NOTES:

△ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110341.

CONTROL DATA

DEVELOPMENT DIVISION

CYBER 2K UDI
ADDRESS COUNTER
LENGTH COUNTER

LOC:A04

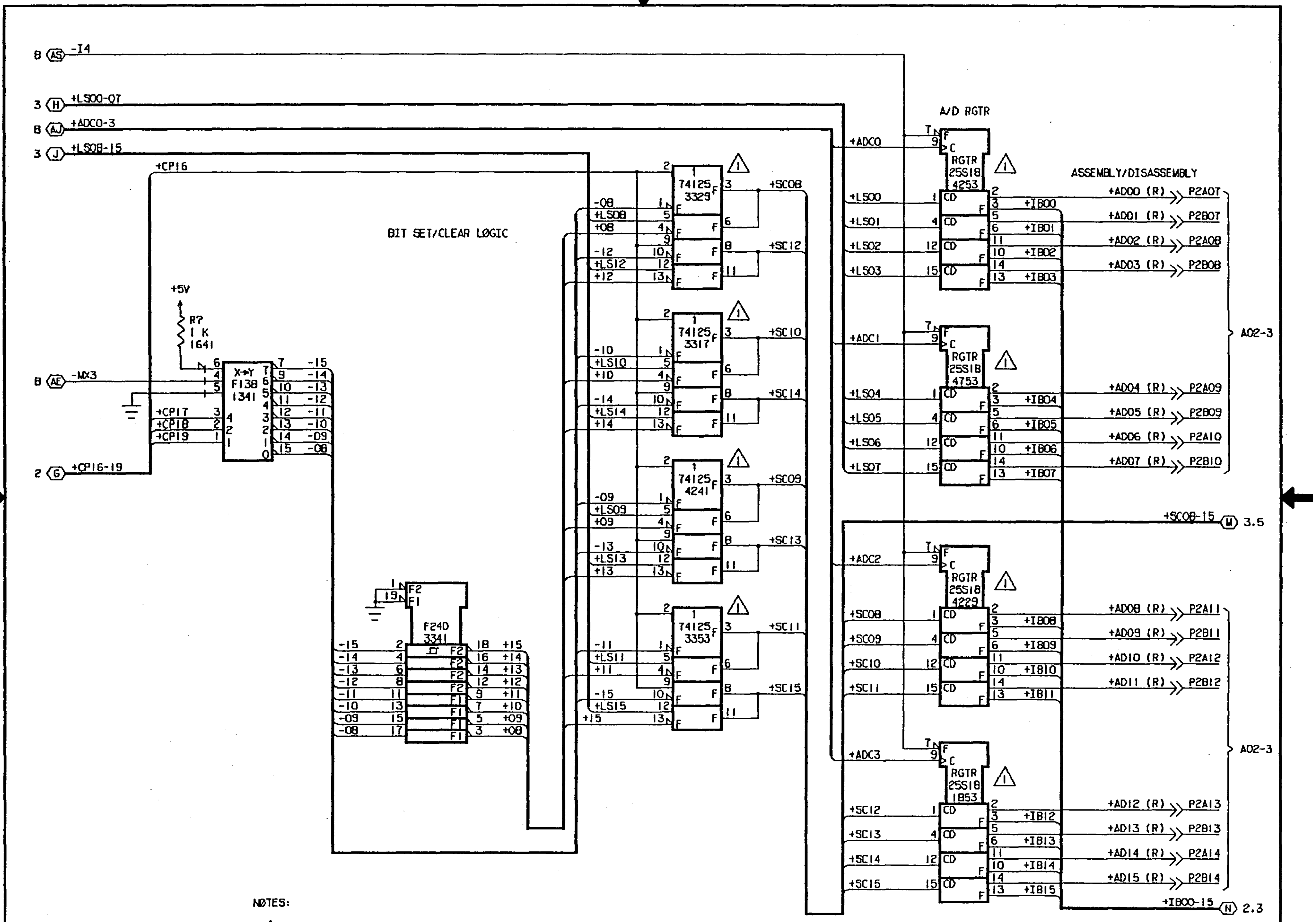
DWG NO 22110161

REV B

C

SHEET UDIC 2K-3-F

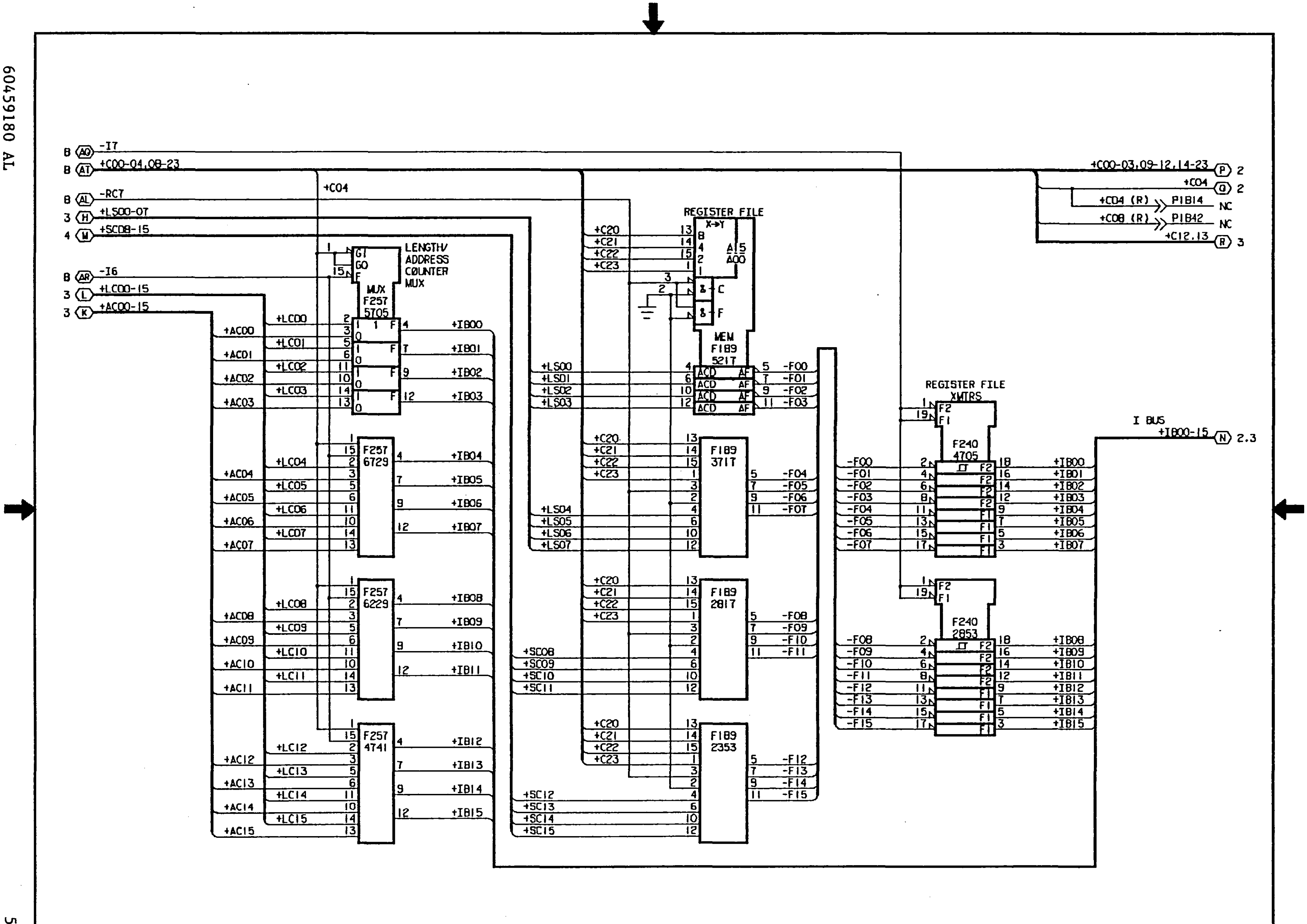
PAGE 3 OF 9



NØTES:

⚠1 CHIP IDENTIFIERS WERE NØT CHANGED ØN PWA-22110341.

CONTROL DATA DEVELOPMENT DIVISION	CYBER 2K UDI BIT SET/CLEAR, ASSEMBLY/ DISASSEMBLY (A/D) RGTR LØC:A04	C	DWG NO 22110161	REV B
			SHEET UDIC 2K-4-F	PAGE 4 OF 9



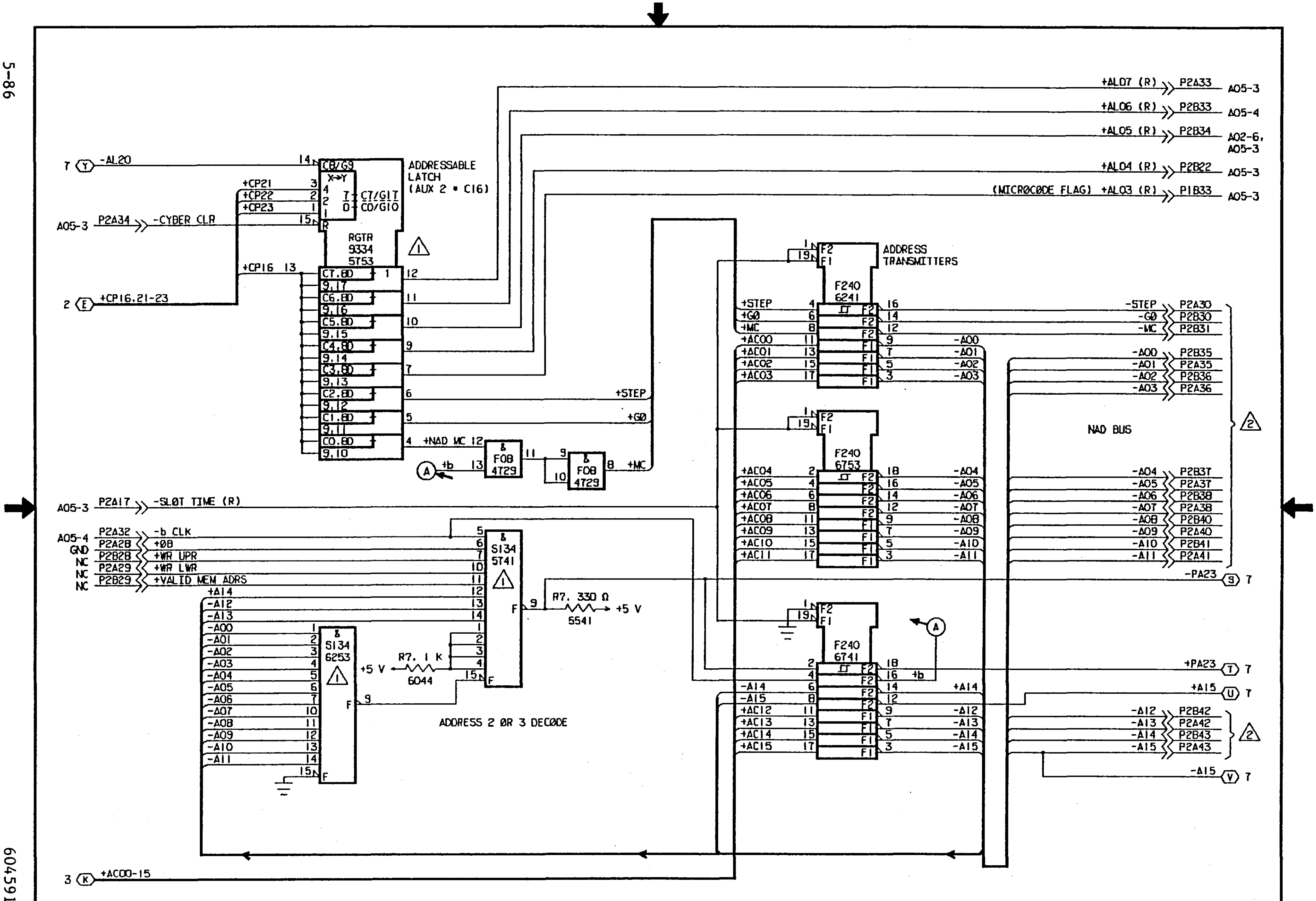
CONTROL DATA

DEVELOPMENT DIVISION

CYBER 2K UDI
LENGTH/ADDRESS MUX, REGISTER FILE, REGISTER FILE XMTRS

LOC:A04

CODE IDENT	DWG NO	REV
C	22110161	B
	SHEET UDIC 2K-5-F	PAGE 5 OF 9



NOTES:

△1 CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110341.

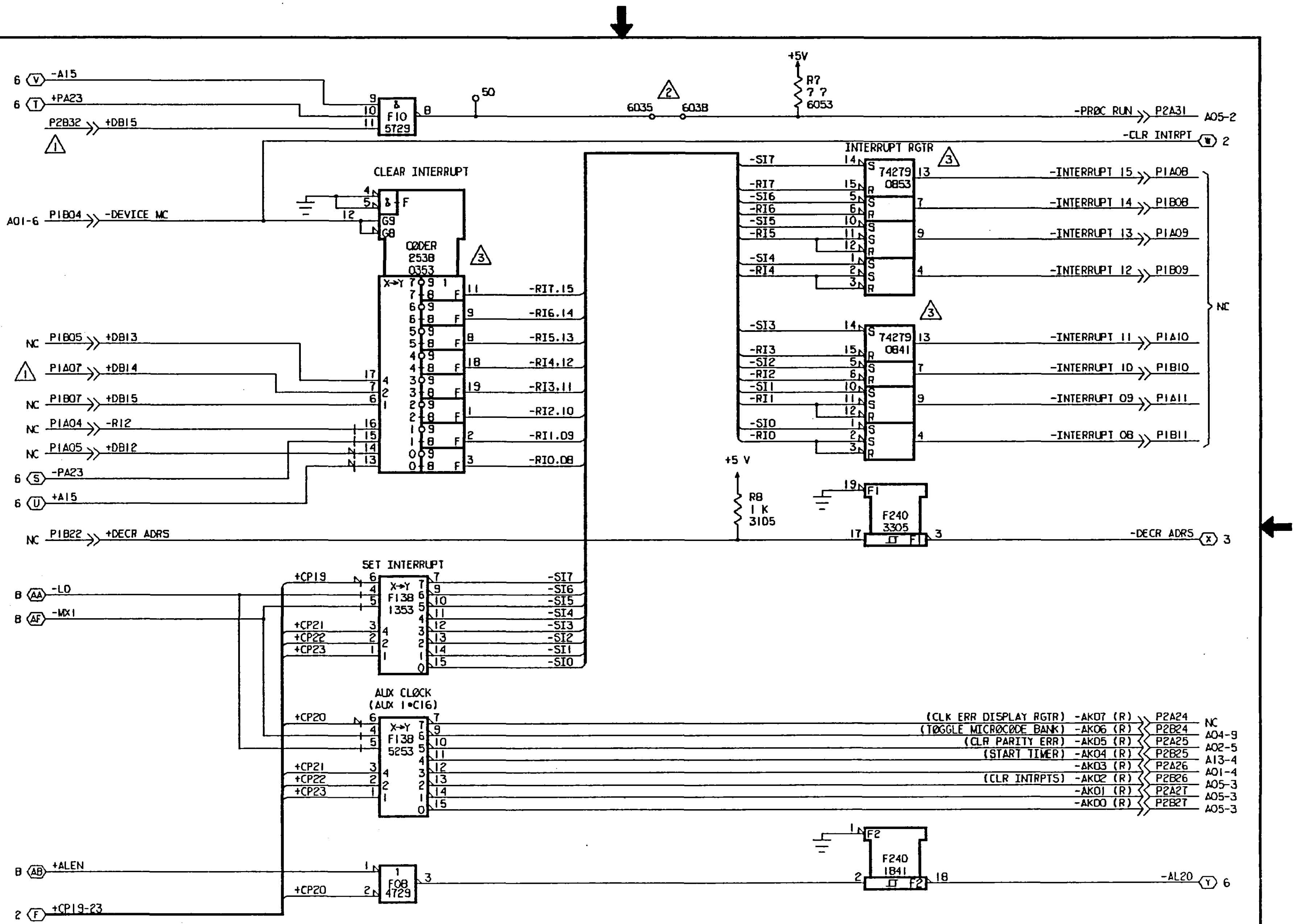
△2 CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI
ADDRESSABLE LATCH, ADDR 2/3
DECODE, ADDRESS TRANSMITTERS
LOC: A04

C

DWG NO 22110161
REV B
SHEET UDIC 2K-6-F
6 OF 9



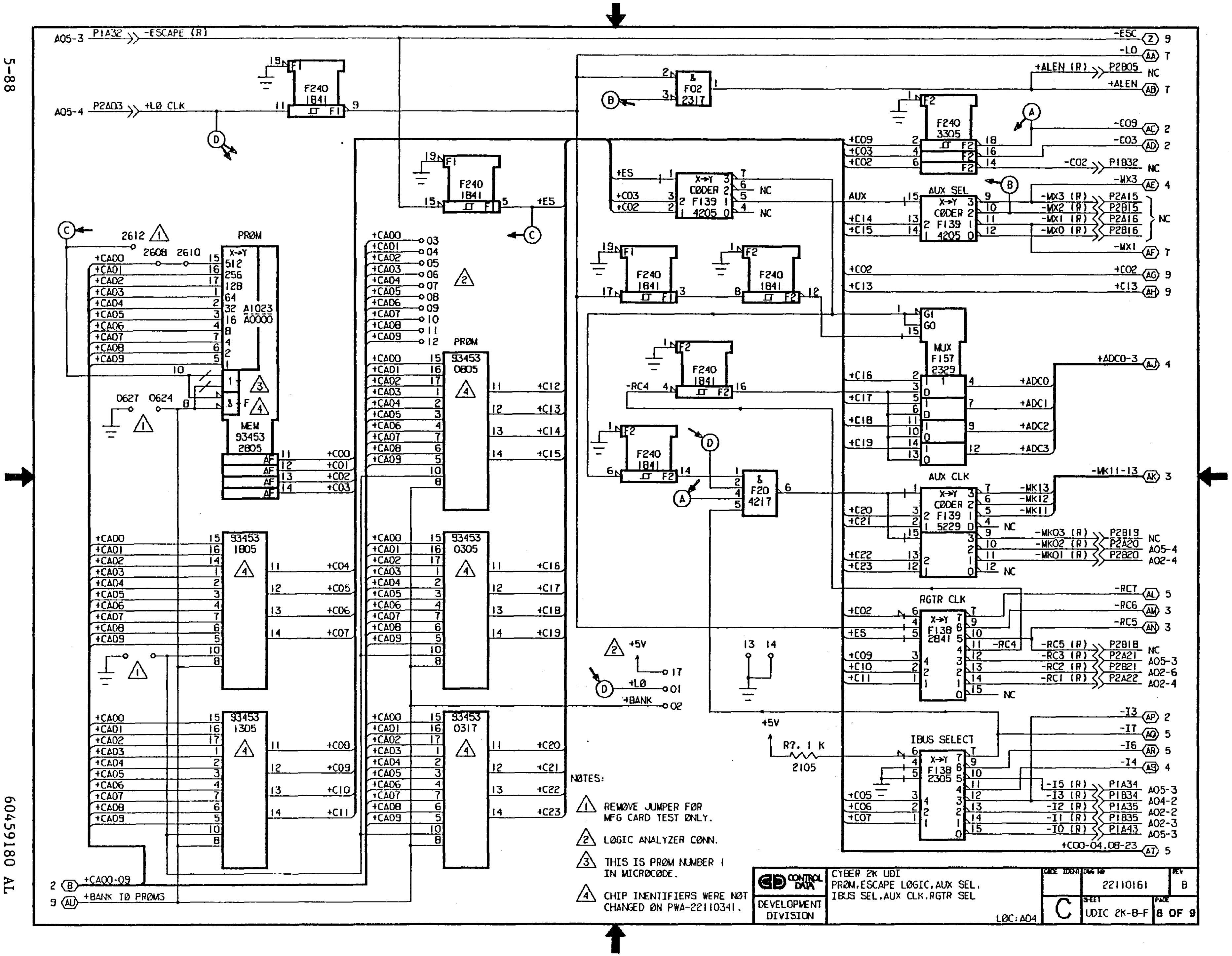
NOTES:

1. P2B32 AND P1A07 ARE TIED TOGETHER ON THE BACKPANEL.
2. REMOVE JUMPER FOR MFG CARD TEST ONLY.
3. CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110341.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI
SET/CLR INTERRUPTS,
INTERRUPT RGTR. AUX CLOCK
LOC:A04

CODE IDENT	DWG NO	REV
C	22110161	B
	SHEET UDIC 2K-7-F	PAGE 7 OF 9



NØTES:

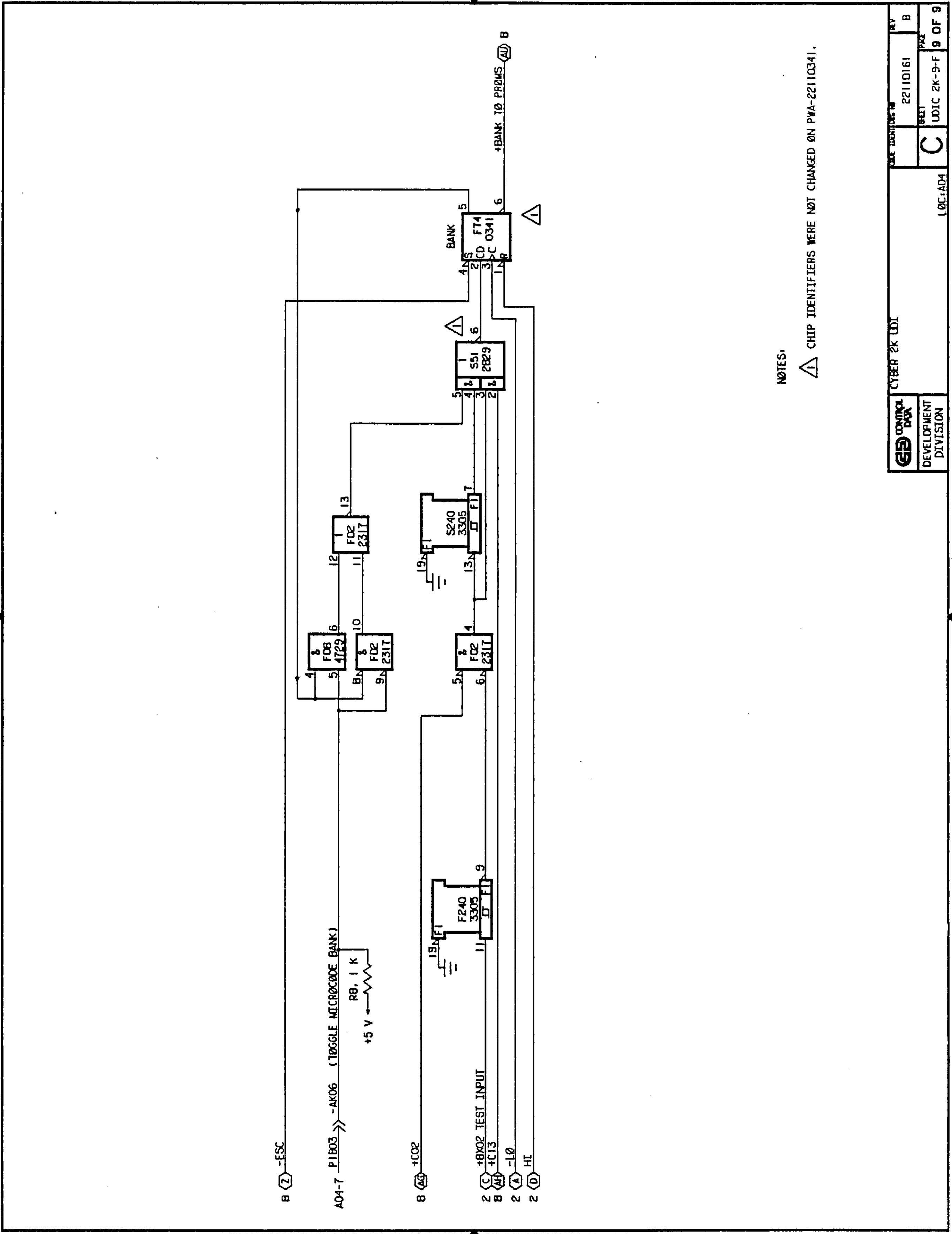
1. REMØVE JUMPER FØR MFG CARD TEST ØNLY.
2. LØGIC ANALYZER CØNN.
3. THIS IS PRØM NUMBER 1 IN MICRØCØDE.
4. CHIP INENTIFIERS WERE NØT CHANGED ØN PWA-22110341.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER 2K UDI
PRØM, ESCAPE LØGIC, AUX SEL,
IBUS SEL, AUX CLK, RGTR SEL

LØC: A04

SIZE	DWG NO	REV
C	22110161	B
	SHEET UDIC 2K-B-F	PAGE 8 OF 9


BANK
FT4
0341
+BANK TO PROMS
AU
S51
2829
FD2
231T
FD8
4729
S240
3305
F240
3305
R8, 1 K
+5 V
B Z -ESC
A04-7 P1B03 -AK06 (TOGGLE MICROCODE BANK)
B AG +C02
2 C +BX02 TEST INPUT
B AH +C13
2 A -L0
2 D HI
NOTES:
1 CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110341.
CONTROL DATA
DEVELOPMENT DIVISION
CYBER 2K UDI
22110161
B
C
UDIC 2K-9-F
9 OF 9
LOC:A04

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UNUSED IC'S

CHIP TYPE	LOCATION	OPEN PINS
S240	4753	(11,9),(13,7),(15,5)
S240	4729	(2,18)
S32	3353	(4,5,6),(9,10,8),(12,13,11)

PAGE				REVISION RECORD					
4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	CA48908	CLASS A RELEASED	KMS	06/87	NS	NS

NOTES:

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	06/87
CHKD	N SAMPSON	06/87
ENGR	R T HENNING	06/87
MFG		
APVD	L B ULFIG	06/87

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
CYBER INTERFACE STATUS
STATUS/CLOCKS

PWA-22194398
PWB-53030937

SIZE C
FSCM NO. 34010
DWG NO. 22110695
LOC: A05
SHEET I/F STATUS 1
PAGE 1 OF 4

CYBER INTERFACE - STATUS (A05-2)

TERMINATORS

This logic provides termination points for data bus, address bus, and control bus signals.

CLOCKS

A Bus Enable, B Bus Enable, and C Bus Enable clocks provide equal data bus access times for the FIPS device interface, processor, and CYBER channel interface.

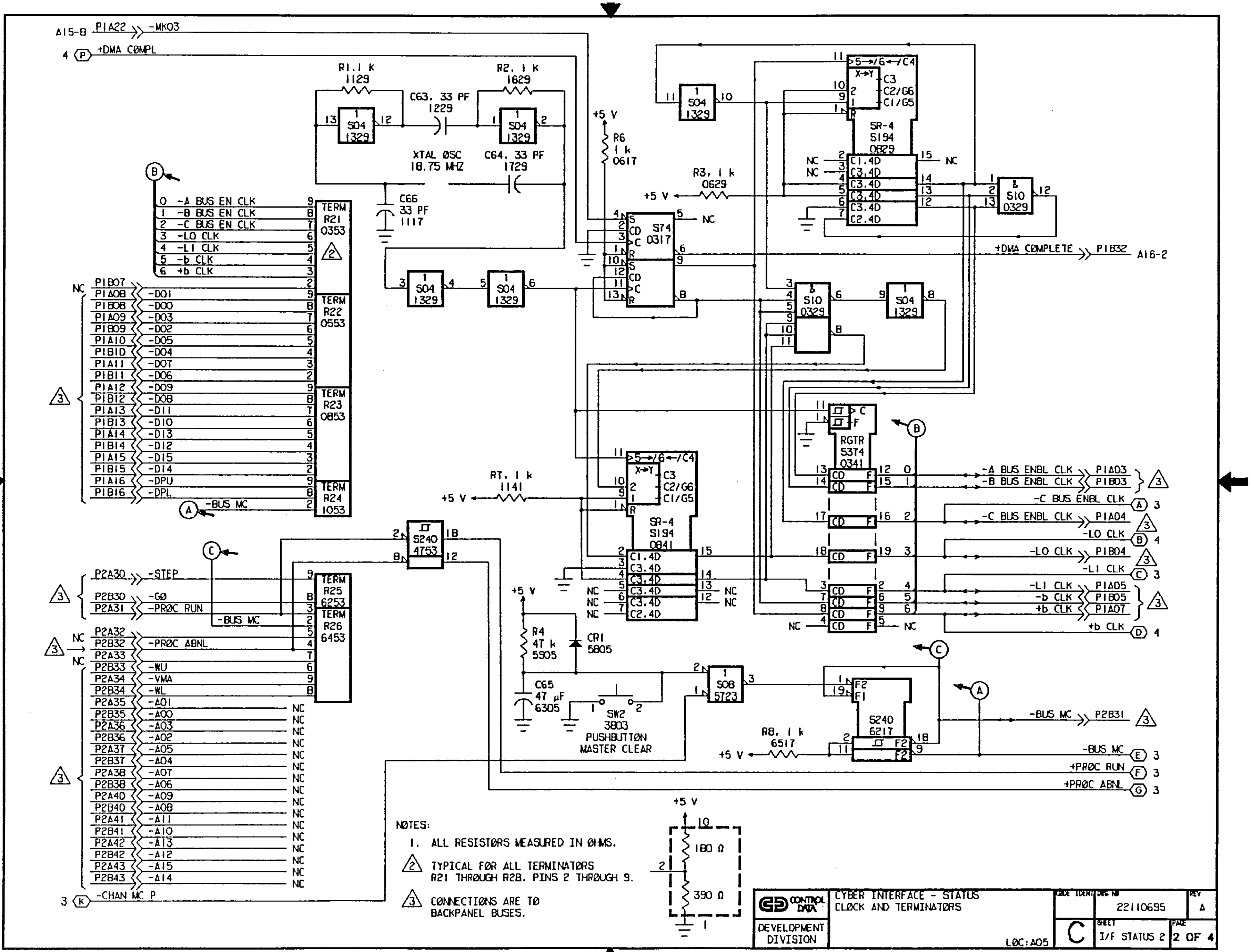
The L0 Clock, L1 Clock, and b Clock signals are used to clock data through various registers and counters in the coupler logic.

PUSHBUTTON MASTER-CLEAR SWITCH

This switch generates a Bus MC (Master Clear) signal when pressed. The Bus MC signal allows the firmware to run the internal diagnostics that check the CYBER channel interface, processor, and FIPS device interface.

PROCESSOR RUN/PROCESSOR ABNORMAL

These signals provide status indications to the CYBER channel. The Processor Run Signal indicates that the processor is running. The Processor Abnormal signal indicates the processor is stopped due to a processor memory parity error.



NOTES:

1. ALL RESISTORS MEASURED IN OHMS.
2. TYPICAL FOR ALL TERMINATORS R21 THROUGH R28. PINS 2 THROUGH 9.
3. CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA	CYBER INTERFACE - STATUS CLOCK AND TERMINATORS	CODE IDENT	DWG NO 22110695	REV A
DEVELOPMENT DIVISION	LOC:A05	C	SHEET I/F STATUS 2	PAGE 2 OF 4

CYBER INTERFACE - STATUS (A05-3)

CONTROL FLAG REGISTER

The control flag register receives various status and control signals from the CYBER channel interface and from the FIPS device interface, and sends them to the UDI (A04-2) on the I bus.

COUPLER ID REGISTER

This register contains an 8-bit hardware unique identifier for the coupler. Backpanel pins for bits SN 20 through SN 27 are grounded or left open to identify the coupler per site requirements. Inputs from switches SW1-1 through SW1-6 (A05-4) are used to define the type of subsystem of which the coupler is a part and to establish operating parameters (see section 2, Operation, for information).

PROCESSOR CONTROL REGISTER

The processor control register receives bits 2 through 8 of the control package op-code word on the UDI I bus (A04-2). The register output enables the CYBER channel interface to perform the specified operation.

DEADMAN TIMEOUT

The deadman timeout (DMTO) circuit (A01-5) generates a DMTO signal when an active CYBER channel has not transferred read or write data for 8.5± 1.5 s.

The DMTO signal sets the deadman timeout FF which, in turn, lights the LED 4 indicator for a visual indication of a deadman timeout condition. The deadman timeout FF clears and LED-4 goes out when a new function signal (A01-4) or Op-code Altered signal (A13-4) is received.

LED INDICATORS

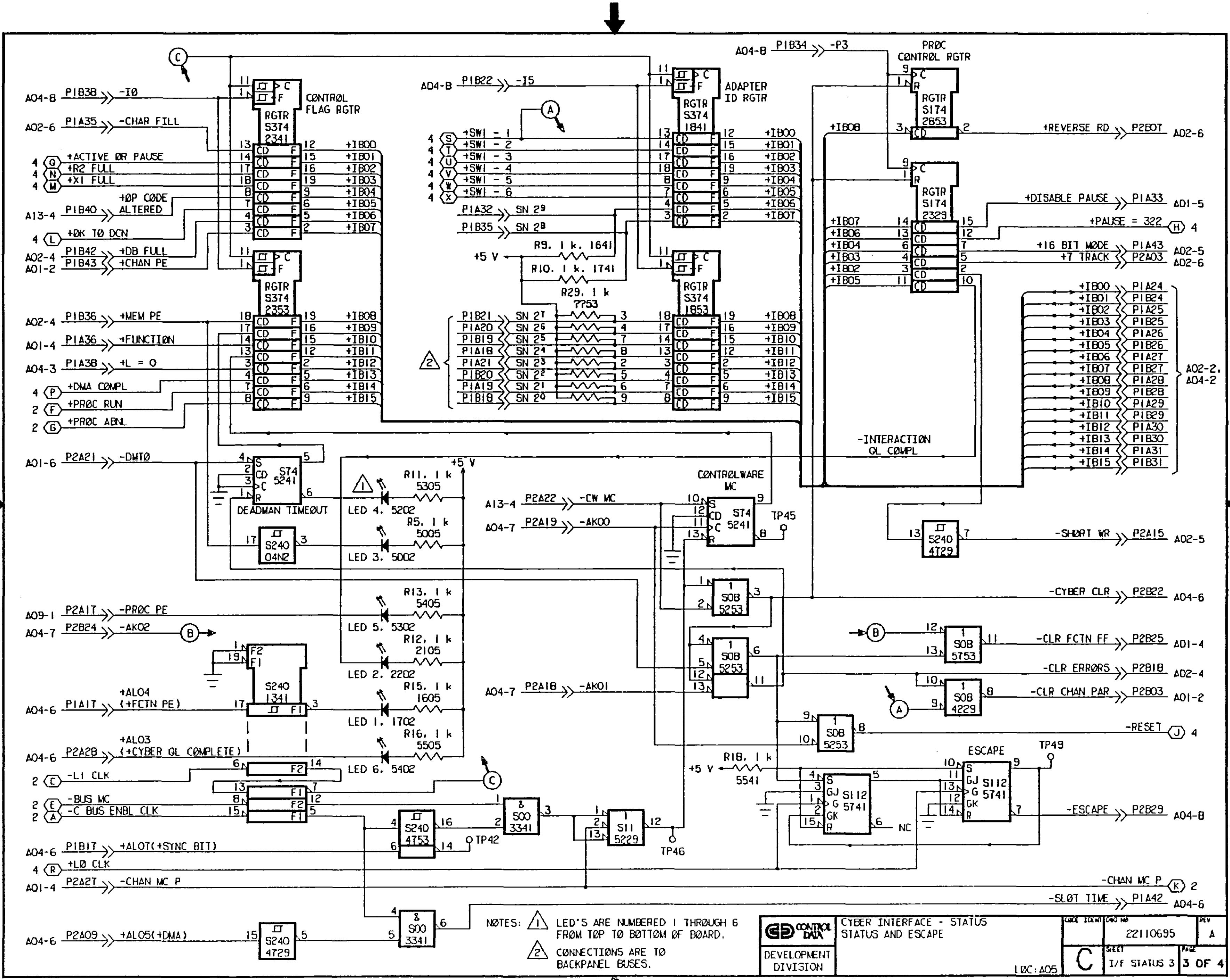
The A05 PC board contains six LED indicators (LED 1 through LED 6). These LEDs indicate the following: LED 1 indicates a channel function parity error. LED 2 lights and then goes out during successful completion of the CYBER channel I/F interaction tests of the internal diagnostic. LED 2 remains lit if the interaction tests fail. LED 3 indicates a memory parity error detected by the CYBER channel interface. LED 4 indicates a deadman timeout (see deadman timeout FF described above). LED 5 indicates a processor parity error. LED 6 lights and then goes out during successful completion of the CYBER channel I/F by the internal diagnostic. LED 5 remains lit if the interface fails the check.

CONTROLWARE MASTER CLEAR FF

The CW MC (Controlware Master Clear) signal generated by the PROM logic (A13-4) sets the controlware MC FF. The output of this FF is sent to the control flag register and then to the UDI (A04-2) on the I bus.

ESCAPE FF

The escape FF is set by a Channel MC, Bus MC, Controlware MC, or DMTO signal. The output of this FF enables the microcode in the UDI (A04-8) to escape to location zero (idle loop).



NOTES: ⚠1 LED'S ARE NUMBERED 1 THROUGH 6 FROM TOP TO BOTTOM OF BOARD.
⚠2 CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA DEVELOPMENT DIVISION	CYBER INTERFACE - STATUS STATUS AND ESCAPE LOC: A05	C	DWG NO 22110695 SHEET I/F STATUS 3	REV A PAGE 3 OF 4

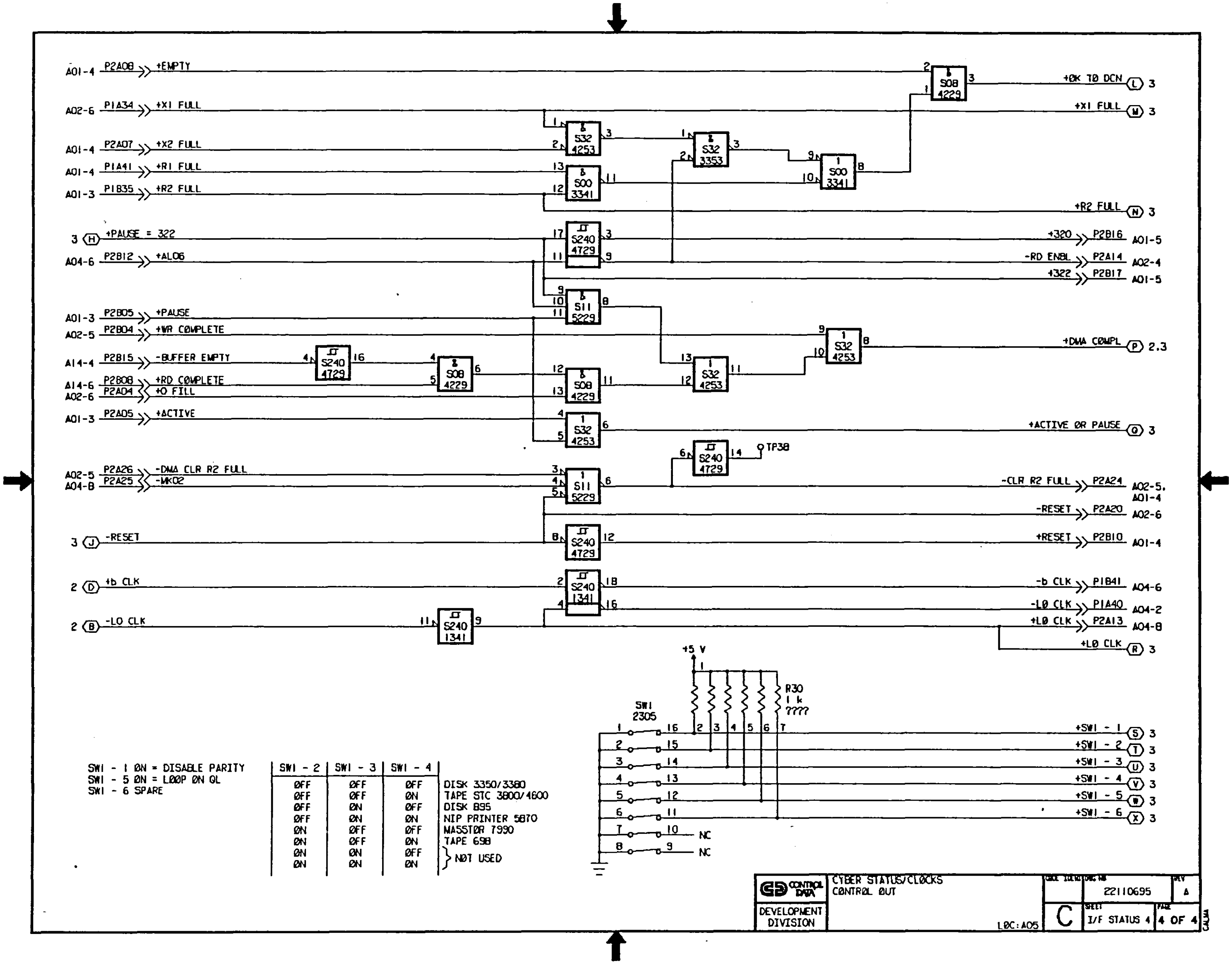
CYBER INTERFACE - STATUS (A05-4)

CONTROL SWITCHES

Switches SW1-1 through SW1-8 are contained on a switch module mounted on the A05 logic module. Switch SW1-1 disables parity checking of CYBER channel data and functions when placed in the On position. Switches SW1-2 through SW1-4 are combined to specify the type of tape or disk equipment that is connected to the coupler. Switch SW1-5 enables the CYBER channel interface to continually loop on its internal diagnostic for maintenance purposes when in the On position. Switch SW1-6 is not used and switches SW1-7 and SW1-8 are not connected.

CONTROL OUT CIRCUITS

This logic contains the control signals needed to transfer data to or from the CYBER channel interface.



SW1 - 1 0N = DISABLE PARITY
SW1 - 5 0N = L00P 0N QL
SW1 - 6 SPARE

SW1 - 2	SW1 - 3	SW1 - 4	
0FF	0FF	0FF	DISK 3350/3380
0FF	0FF	0N	TAPE STC 3800/4600
0FF	0N	0FF	DISK 895
0FF	0N	0N	NIP PRINTER 5870
0N	0FF	0FF	MASST0R 7990
0N	0FF	0N	TAPE 698
0N	0N	0FF	} N0T USED
0N	0N	0N	

CONTROL DATA
DEVELOPMENT DIVISION
CYBER STATUS/CL0CKS
C0NTR0L 0UT
L0C:A05
DWG NO 22110695
REV A
C
SHEET I/F STATUS 4
PAGE 4 OF 4
CALMA

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UNUSED IC'S

CHIP TYPE	LOCATION	OPEN PINS
S04	28D0	(1,2),(3,4),(13,12)
S240	04N2	(11,9),(13,7),(15,5)
S240	28N2	(2,18)
S32	04I7	(4,5,6),(9,10,8),(12,13,11)

UNUSED RESISTORS

VALUE	LOCATION	PINS	RESISTOR	+5 V	GND
180,390	04C1	4,5,6,7,8	RP4	X	X
180,390	04R7	6,7,8,9	RP5	X	X
180,390	04S3	8,9	RP6	X	X

REVISION RECORD

PAGE				REVISION RECORD					
4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A		CLASS A RELEASED	MES	05/85	NZ	RTH
A	A	B	B	CA47162	SEE C.O.	MES	01/86	NZ	RTH
C	C	C	C	CA48097	INACTIVE, FOR SERVICE USE ONLY SUPERSEDED BY DWG. 22110160	MES	8/11/86	NS	NS
D	D	D	D	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/25/87	NS	NS

NOTES:

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3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	05/85
CHKD	N ZAK	05/85
ENGR	R T HENNING	07/85
MFG	B J REILAND	07/85
APVD	R T HENNING	07/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
CYBER STATUS/CLOCKS

PWA- 53812422
PWB- 53812423

SIZE C
FSCM NO. 34010
DWG NO. 53592095

LOC: A05
SHEET STATUS 1
PAGE 1 OF 4

CYBER INTERFACE - STATUS (A05-2)

TERMINATORS

This logic provides termination points for data bus, address bus, and control bus signals.

CLOCKS

A Bus Enable, B Bus Enable, and C Bus Enable clocks provide equal data bus access times for the FIPS device interface, processor, and CYBER channel interface.

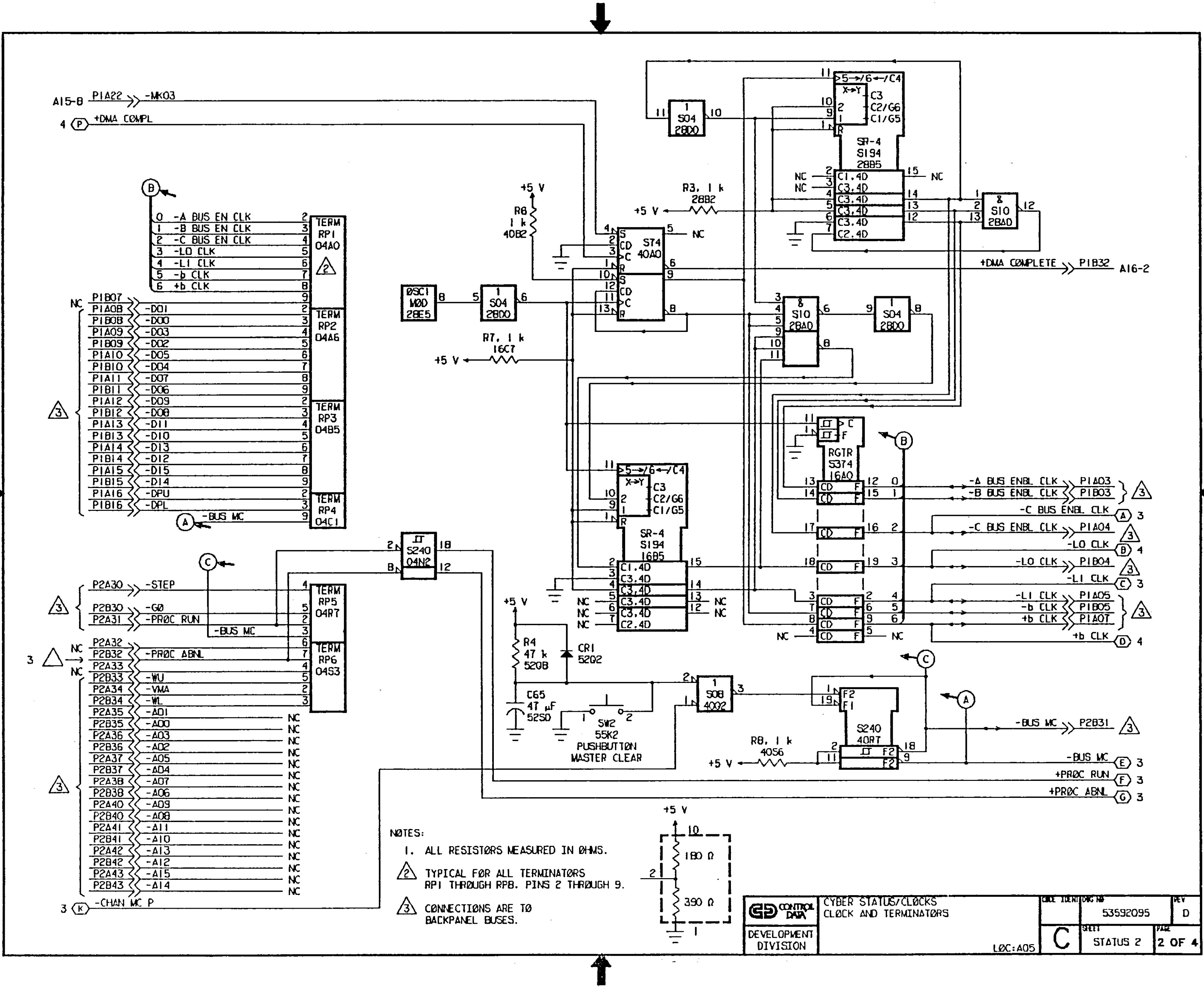
The L0 Clock, L1 Clock, and b Clock signals are used to clock data through various registers and counters in the coupler logic.

PUSHBUTTON MASTER-CLEAR SWITCH

This switch generates a Bus MC (Master Clear) signal when pressed. The Bus MC signal allows the firmware to run the internal diagnostics that check the CYBER channel interface, processor, and FIPS device interface.

PROCESSOR RUN/PROCESSOR ABNORMAL

These signals provide status indications to the CYBER channel. The Processor Run Signal indicates that the processor is running. The Processor Abnormal signal indicates the processor is stopped due to a processor memory parity error.



NOTES:

1. ALL RESISTORS MEASURED IN OHMS.
2. TYPICAL FOR ALL TERMINATORS RP1 THROUGH RP8. PINS 2 THROUGH 9.
3. CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA
DEVELOPMENT DIVISION

CYBER STATUS/CLOCKS
CLOCK AND TERMINATORS

LOC:A05

CODE IDENT	DWG NO	REV
C	53592095	D
SHEET	STATUS 2	PAGE 2 OF 4

CYBER INTERFACE - STATUS (A05-3)

CONTROL FLAG REGISTER

The control flag register receives various status and control signals from the CYBER channel interface and from the FIPS device interface, and sends them to the UDI (A04-2) on the I bus.

COUPLER ID REGISTER

This register contains an 8-bit hardware unique identifier for the coupler. Backpanel pins for bits SN 20 through SN 27 are grounded or left open to identify the coupler per site requirements. Inputs from switches SW1-1 through SW1-6 (A05-4) are used to define the type of subsystem of which the coupler is a part and to establish operating parameters (see section 2, Operation, for information).

PROCESSOR CONTROL REGISTER

The processor control register receives bits 2 through 8 of the control package op-code word on the UDI I bus (A04-2). The register output enables the CYBER channel interface to perform the specified operation.

DEADMAN TIMEOUT

The deadman timeout (DMTO) circuit (A01-5) generates a DMTO signal when an active CYBER channel has not transferred read or write data for 8.5± 1.5 s.

The DMTO signal sets the deadman timeout FF which, in turn, lights the LED 4 indicator for a visual indication of a deadman timeout condition. The deadman timeout FF clears and LED-4 goes out when a new function signal (A01-4) or Op-code Altered signal (A13-4) is received.

LED INDICATORS

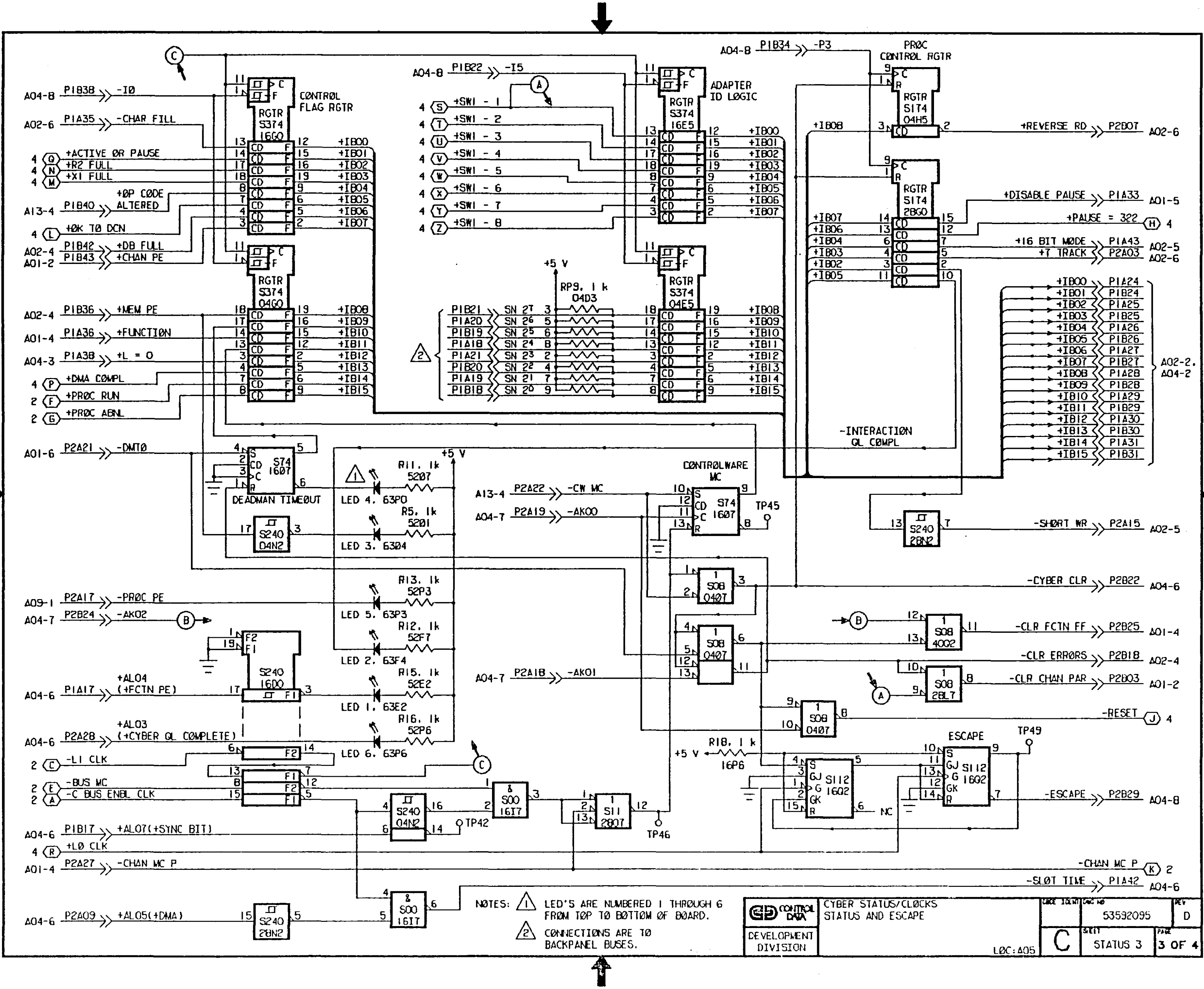
The A05 PC board contains six LED indicators (LED 1 through LED 6). These LEDs indicate the following: LED 1 indicates a channel function parity error. LED 2 lights and then goes out during successful completion of the CYBER channel I/F interaction tests of the internal diagnostic. LED 2 remains lit if the interaction tests fail. LED 3 indicates a memory parity error detected by the CYBER channel interface. LED 4 indicates a deadman timeout (see deadman timeout FF described above). LED 5 indicates a processor parity error. LED 6 lights and then goes out during successful completion of the CYBER channel I/F by the internal diagnostic. LED 5 remains lit if the interface fails the check.

CONTROLWARE MASTER CLEAR FF

The CW MC (Controlware Master Clear) signal generated by the PROM logic (A13-4) sets the controlware MC FF. The output of this FF is sent to the control flag register and then to the UDI (A04-2) on the I bus.

ESCAPE FF

The escape FF is set by a Channel MC, Bus MC, Controlware MC, or DMTO signal. The output of this FF enables the microcode in the UDI (A04-8) to escape to location zero (idle loop).



NOTES: ⚠1 LED'S ARE NUMBERED 1 THROUGH 6 FROM TOP TO BOTTOM OF BOARD.

⚠2 CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA

DEVELOPMENT DIVISION

CYBER STATUS/CLOCKS STATUS AND ESCAPE

LOC: A05

CAGE IDENT	DWG NO	REV
C	53532095	D
	SHEET STATUS 3	PAGE 3 OF 4

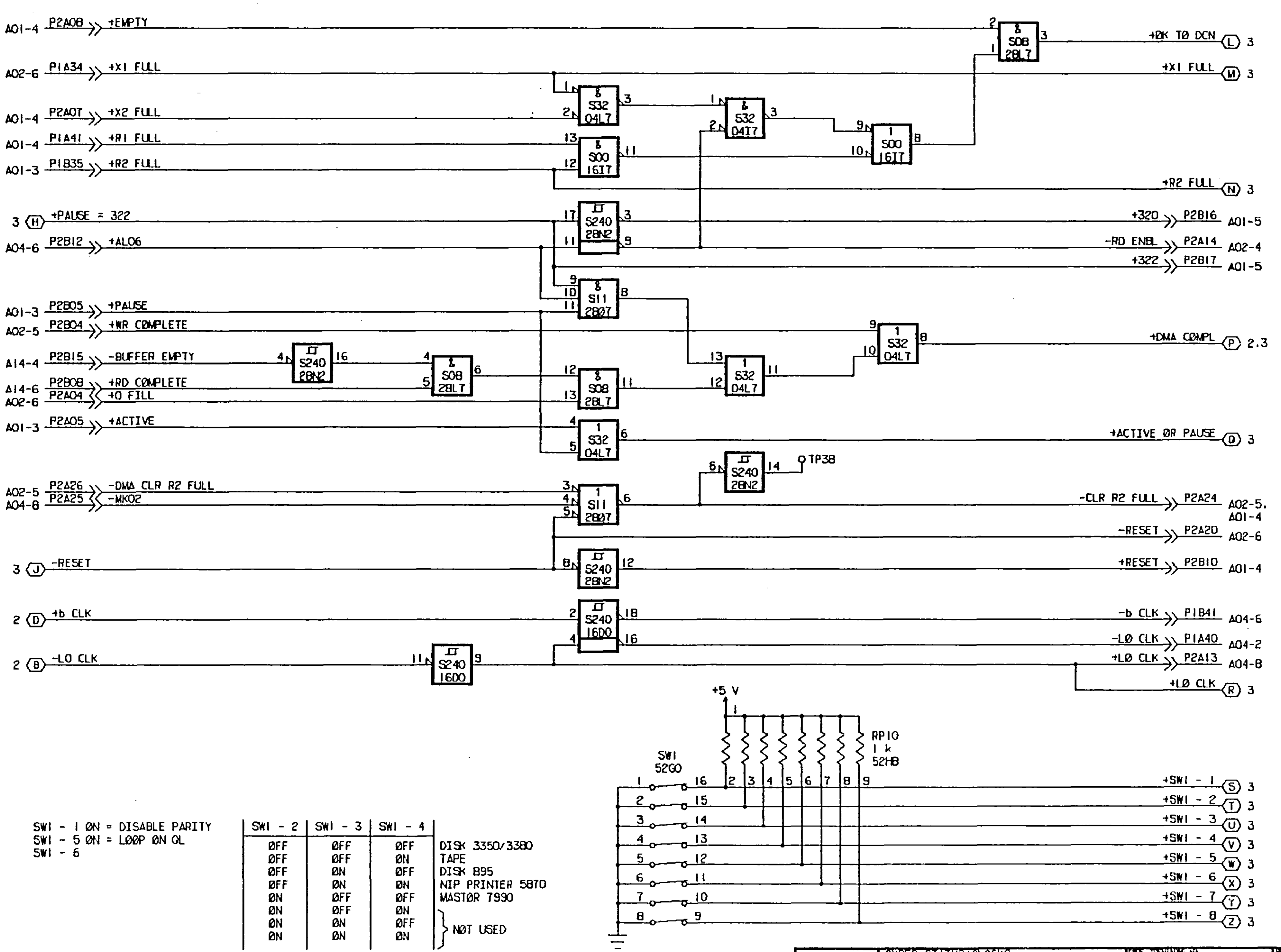
CYBER INTERFACE - STATUS (A05-4)

CONTROL SWITCHES

Switches SW1-1 through SW1-8 are contained on a switch module mounted on the A05 logic module. Switch SW1-1 disables parity checking of CYBER channel data and functions when placed in the On position. Switches SW1-2 through SW1-4 are combined to specify the type of tape or disk equipment that is connected to the coupler. Switch SW1-5 enables the CYBER channel interface to continually loop on its internal diagnostic for maintenance purposes when in the On position. Switch SW1-6 is not used and switches SW1-7 and SW1-8 are not connected.

CONTROL OUT CIRCUITS

This logic contains the control signals needed to transfer data to or from the CYBER channel interface.



SW1 - 1 ON = DISABLE PARITY
SW1 - 5 ON = LOOP ON QL
SW1 - 6

SW1 - 2	SW1 - 3	SW1 - 4	
OFF	OFF	OFF	DISK 3350/3380
OFF	OFF	ON	TAPE
OFF	ON	OFF	DISK 895
OFF	ON	ON	NIP PRINTER 5870
ON	OFF	OFF	MASTOR 7990
ON	OFF	ON	NOT USED
ON	ON	OFF	NOT USED
ON	ON	ON	NOT USED

CONTROL DATA
DEVELOPMENT DIVISION
CYBER STATUS/CLOCKS
CONTROL OUT
LOC: A05
C
DWG NO 53592095
REV D
SHEET STATUS 4
PAGE 4 OF 4

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PAGE				REVISION RECORD					
4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	CA48097	CLASS A RELEASE	MES	8/11/86	NS	RTH
B	B	B	B	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/22/87	NS	NS
B	B	C	C	CA48539	SEE NOTE 5.	MES	1/30/87	NS	NS

UNUSED IC'S

CHIP TYPE	LOCATION	OPEN PINS
F04	28D0	(1,2),(3,4),(13,12)
F240	04N2	(11,9),(13,7),(15,5)
F240	28N2	(2,18)
F32	04I7	(4,5,6),(9,10,8),(12,13,11)

UNUSED RESISTORS

VALUE	LOCATION	PINS	RESISTOR	+5 V	GND
180,390	04C1	4,5,6,7,8	RP4	X	X
180,390	04R7	6,7,8,9	RP5	X	X
180,390	04S3	8,9	RP6	X	X

NOTES:

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2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.
4. ALL CHIP IDENTIFIERS ON PWA-22110340 WERE CHANGED TO 'F' TYPE CHIPS, UNLESS OTHERWISE NOTED. EXAMPLE - 'F74' ON PWA-22110340 IS 'S74' ON PWA-53812422.
5. THE CHIP IDENTIFIER AT LOCATION 16A0 WAS CHANGED BACK TO 'S374' FROM 'F374'. SEE PAGE 2.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	5/19/86
CHKD	N ZAK	5/19/86
ENGR	R T HENNING	8/11/86
MFG	B J REILAND	8/11/86
APVD	R T HENNING	8/11/86

EQUIP. NO. FR205-A
THIRD ANGLE PROJECTION

CONTROL DATA
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
CYBER STATUS/CLOCKS

PWA-22114772
PWB-53812423
SIZE C
FSCM NO. 34010
DWG NO. 22110160
LOC: A05
SHEET STATUS 1-F
PAGE 1 OF 4

CYBER INTERFACE - STATUS (A05-2)

TERMINATORS

This logic provides termination points for data bus, address bus, and control bus signals.

CLOCKS

A Bus Enable, B Bus Enable, and C Bus Enable clocks provide equal data bus access times for the FIPS device interface, processor, and CYBER channel interface.

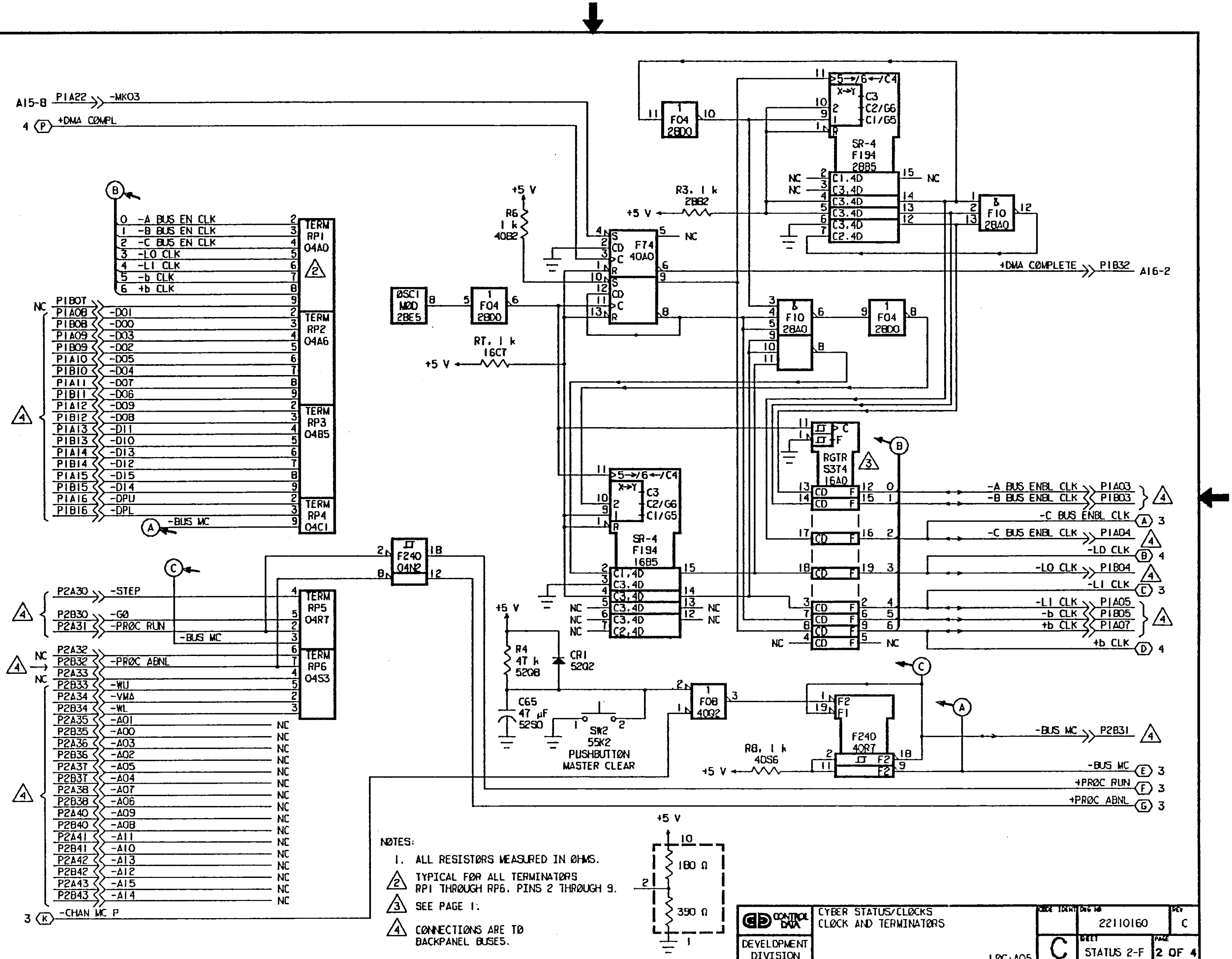
The L0 Clock, L1 Clock, and b Clock signals are used to clock data through various registers and counters in the coupler logic.

PUSHBUTTON MASTER-CLEAR SWITCH

This switch generates a Bus MC (Master Clear) signal when pressed. The Bus MC signal allows the firmware to run the internal diagnostics that check the CYBER channel interface, processor, and FIPS device interface.

PROCESSOR RUN/PROCESSOR ABNORMAL

These signals provide status indications to the CYBER channel. The Processor Run Signal indicates that the processor is running. The Processor Abnormal signal indicates the processor is stopped due to a processor memory parity error.



NOTES:

1. ALL RESISTORS MEASURED IN OHMS.

2. TYPICAL FOR ALL TERMINATORS RP1 THROUGH RP6, PINS 2 THROUGH 9.

3. SEE PAGE 1.

4. CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA DEVELOPMENT DIVISION	CYBER STATUS/CLOCKS CLOCK AND TERMINATORS LOC: A05	C	DWG NO 22110160 SHEET STATUS 2-F	REV C PAGE 2 OF 4

CYBER INTERFACE - STATUS (A05-3)

CONTROL FLAG REGISTER

The control flag register receives various status and control signals from the CYBER channel interface and from the FIPS device interface, and sends them to the UDI (A04-2) on the I bus.

COUPLER ID REGISTER

This register contains an 8-bit hardware unique identifier for the coupler. Backpanel pins for bits SN 20 through SN 27 are grounded or left open to identify the coupler per site requirements. Inputs from switches SW1-1 through SW1-6 (A05-4) are used to define the type of subsystem of which the coupler is a part and to establish operating parameters (see section 2, Operation, for information).

PROCESSOR CONTROL REGISTER

The processor control register receives bits 2 through 8 of the control package op-code word on the UDI I bus (A04-2). The register output enables the CYBER channel interface to perform the specified operation.

DEADMAN TIMEOUT

The deadman timeout (DMTO) circuit (A01-5) generates a DMTO signal when an active CYBER channel has not transferred read or write data for 8.5± 1.5 s.

The DMTO signal sets the deadman timeout FF which, in turn, lights the LED 4 indicator for a visual indication of a deadman timeout condition. The deadman timeout FF clears and LED-4 goes out when a new function signal (A01-4) or Op-code Altered signal (A13-4) is received.

LED INDICATORS

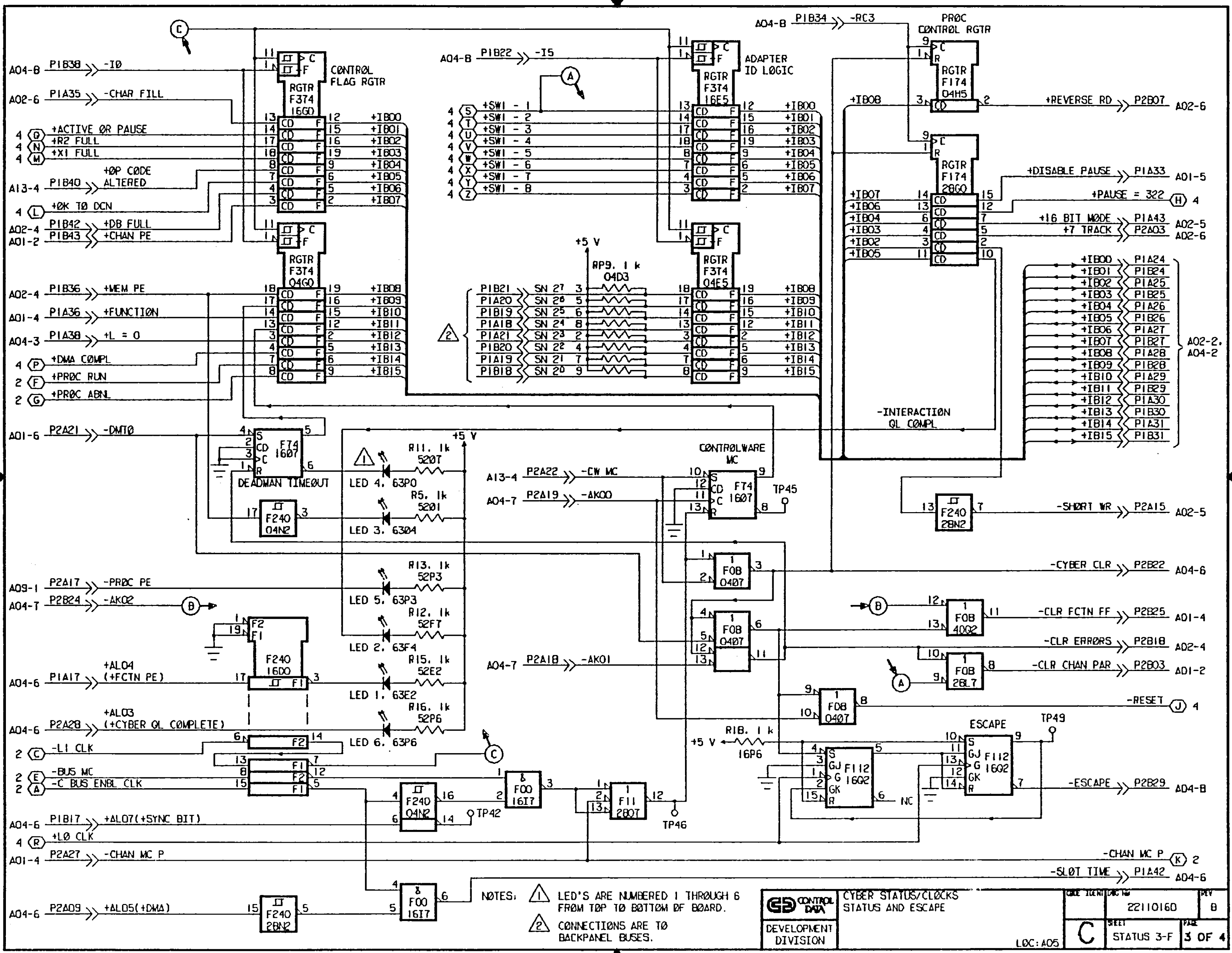
The A05 PC board contains six LED indicators (LED 1 through LED 6). These LEDs indicate the following: LED 1 indicates a channel function parity error. LED 2 lights and then goes out during successful completion of the CYBER channel I/F interaction tests of the internal diagnostic. LED 2 remains lit if the interaction tests fail. LED 3 indicates a memory parity error detected by the CYBER channel interface. LED 4 indicates a deadman timeout (see deadman timeout FF described above). LED 5 indicates a processor parity error. LED 6 lights and then goes out during successful completion of the CYBER channel I/F by the internal diagnostic. LED 5 remains lit if the interface fails the check.

CONTROLWARE MASTER CLEAR FF

The CW MC (Controlware Master Clear) signal generated by the PROM logic (A13-4) sets the controlware MC FF. The output of this FF is sent to the control flag register and then to the UDI (A04-2) on the I bus.

ESCAPE FF

The escape FF is set by a Channel MC, Bus MC, Controlware MC, or DMTO signal. The output of this FF enables the microcode in the UDI (A04-8) to escape to location zero (idle loop).



NOTES:
1. LED'S ARE NUMBERED 1 THROUGH 6 FROM TOP TO BOTTOM OF BOARD.
2. CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA DEVELOPMENT DIVISION	CYBER STATUS/CLOCKS STATUS AND ESCAPE LOC: A05	DWG NO 22110160	REV B
		C	SHEET STATUS 3-F · PAGE 3 OF 4

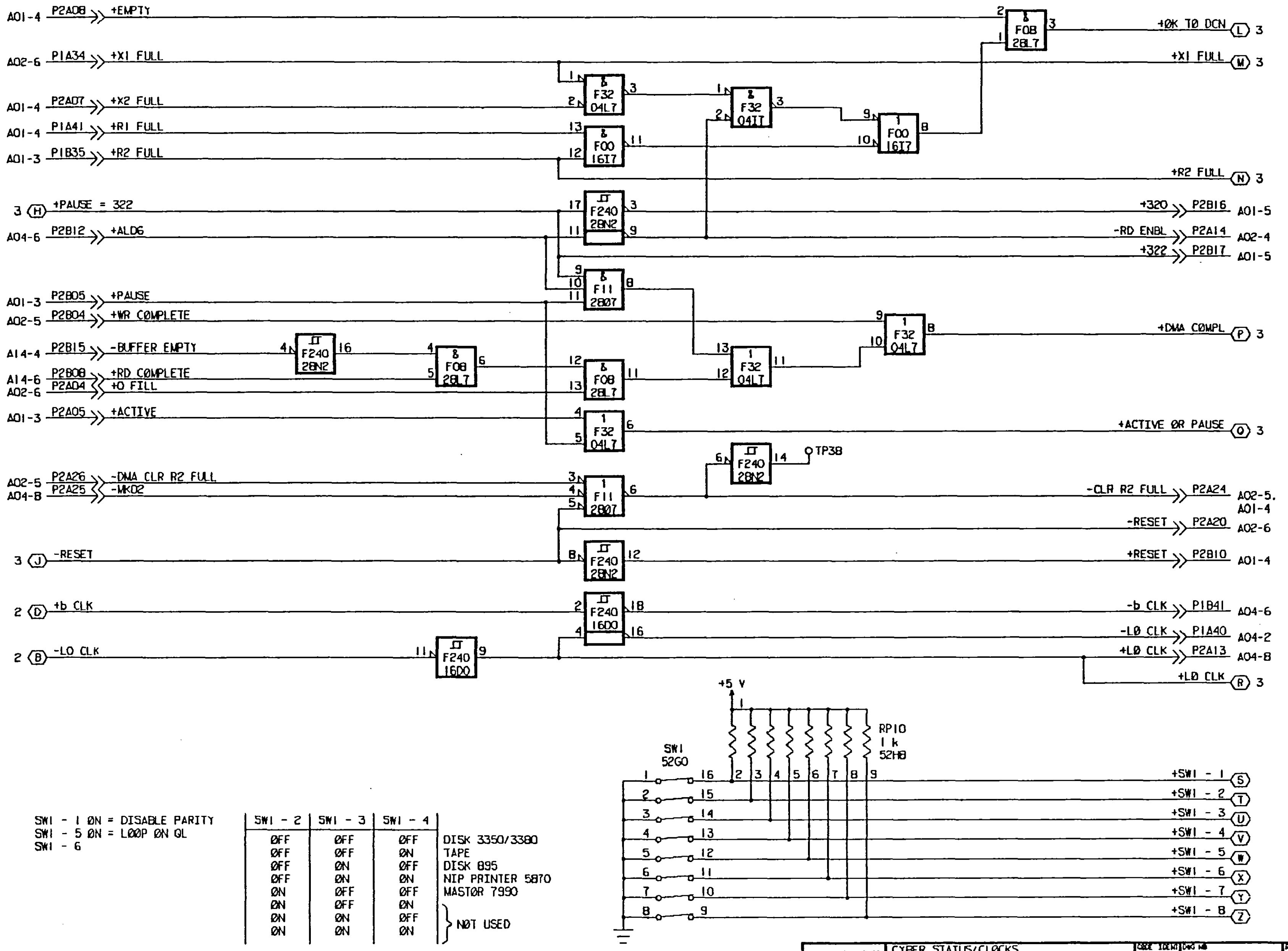
CYBER INTERFACE - STATUS (A05-4)

CONTROL SWITCHES

Switches SW1-1 through SW1-8 are contained on a switch module mounted on the A05 logic module. Switch SW1-1 disables parity checking of CYBER channel data and functions when placed in the On position. Switches SW1-2 through SW1-4 are combined to specify the type of tape or disk equipment that is connected to the coupler. Switch SW1-5 enables the CYBER channel interface to continually loop on its internal diagnostic for maintenance purposes when in the On position. Switch SW1-6 is not used and switches SW1-7 and SW1-8 are not connected.

CONTROL OUT CIRCUITS

This logic contains the control signals needed to transfer data to or from the CYBER channel interface.



SW1 - 1 ON = DISABLE PARITY
SW1 - 5 ON = LOOP ON QL
SW1 - 6

SW1 - 2	SW1 - 3	SW1 - 4	
OFF	OFF	OFF	DISK 3350/3380
OFF	OFF	ON	TAPE
OFF	ON	OFF	DISK 895
OFF	ON	ON	NIP PRINTER 5870
ON	OFF	OFF	MASTOR 7990
ON	OFF	ON	NOT USED
ON	ON	OFF	
ON	ON	ON	

CONTROL DATA
DEVELOPMENT DIVISION

CYBER STATUS/CLOCKS
CONTROL OUT

LOC:A05

CODE IDENT	DWG NO	REV
	22110160	B
C	SHEET STATUS 4-F	PAGE 4 OF 4

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PAGE									REVISION RECORD					
9	8	7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A	A	A	CA48908	CLASS A RELEASE	KMS	06/87	NS	NS

NOTES:

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	06/87
CHKD	N SAMPSON	06/87
ENGR	R CAIN	06/87
MFG		
APVD	L B ULFIG	06/87

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

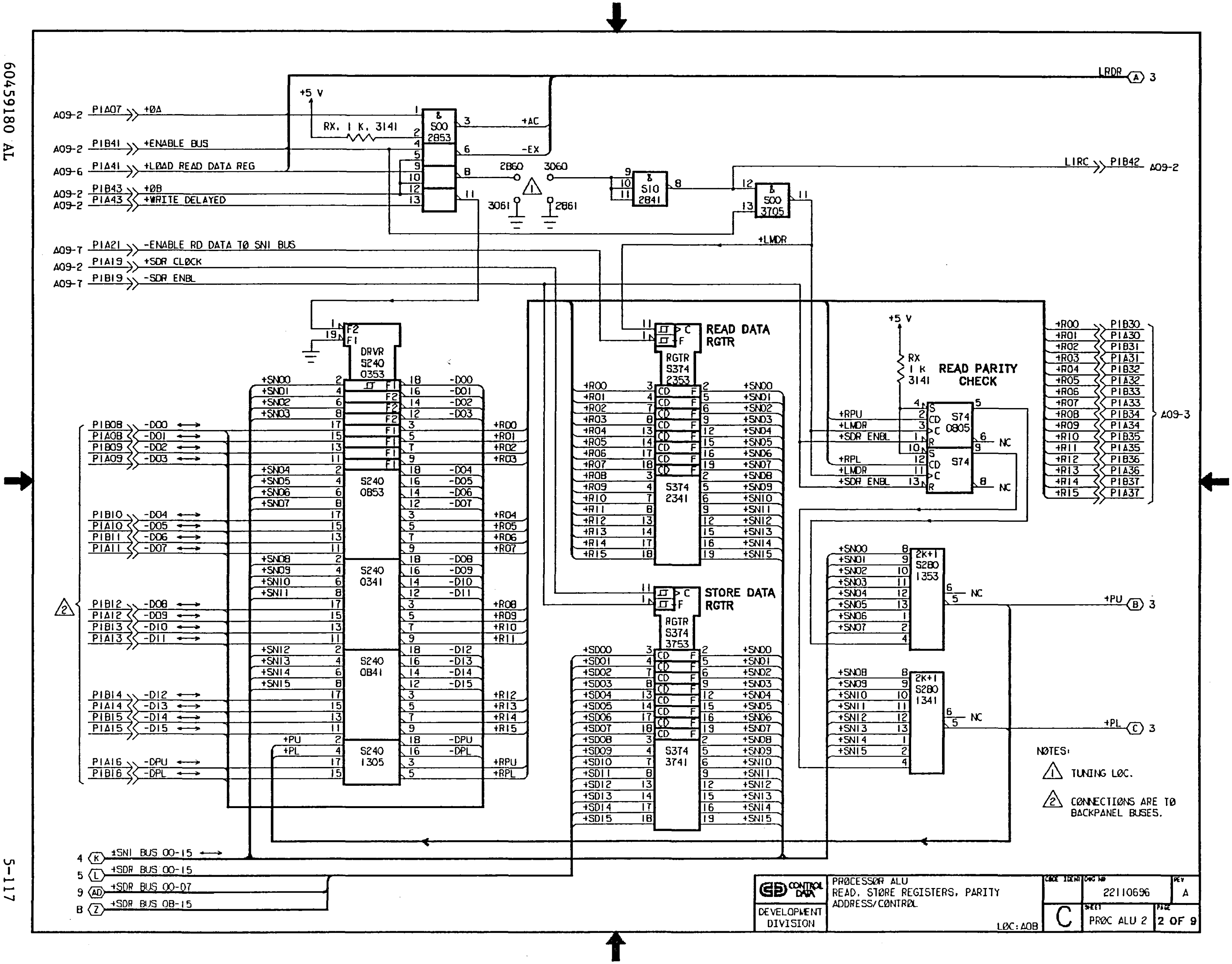
TITLE
LOGIC DIAGRAM PROCESSOR ALU

PWA-53595819
PWB-52803442

SIZE C
FSCM NO. 34010
DWG NO. 22110696
LOC: A08
SHEET PROC ALU 1
PAGE 1 OF 9

PROCESSOR ALU (A08-2)

The processor arithmetic logic unit (ALU) is an internally programmed, parallel mode, device that controls basic internal operations on the data bus, CYBER channel interface, and FIPS device interface of the coupler. For details of operation, including the internal instruction set of the processor, refer to appendix B of the CYBER Channel Coupler Hardware Reference Manual (see preface for publication number).

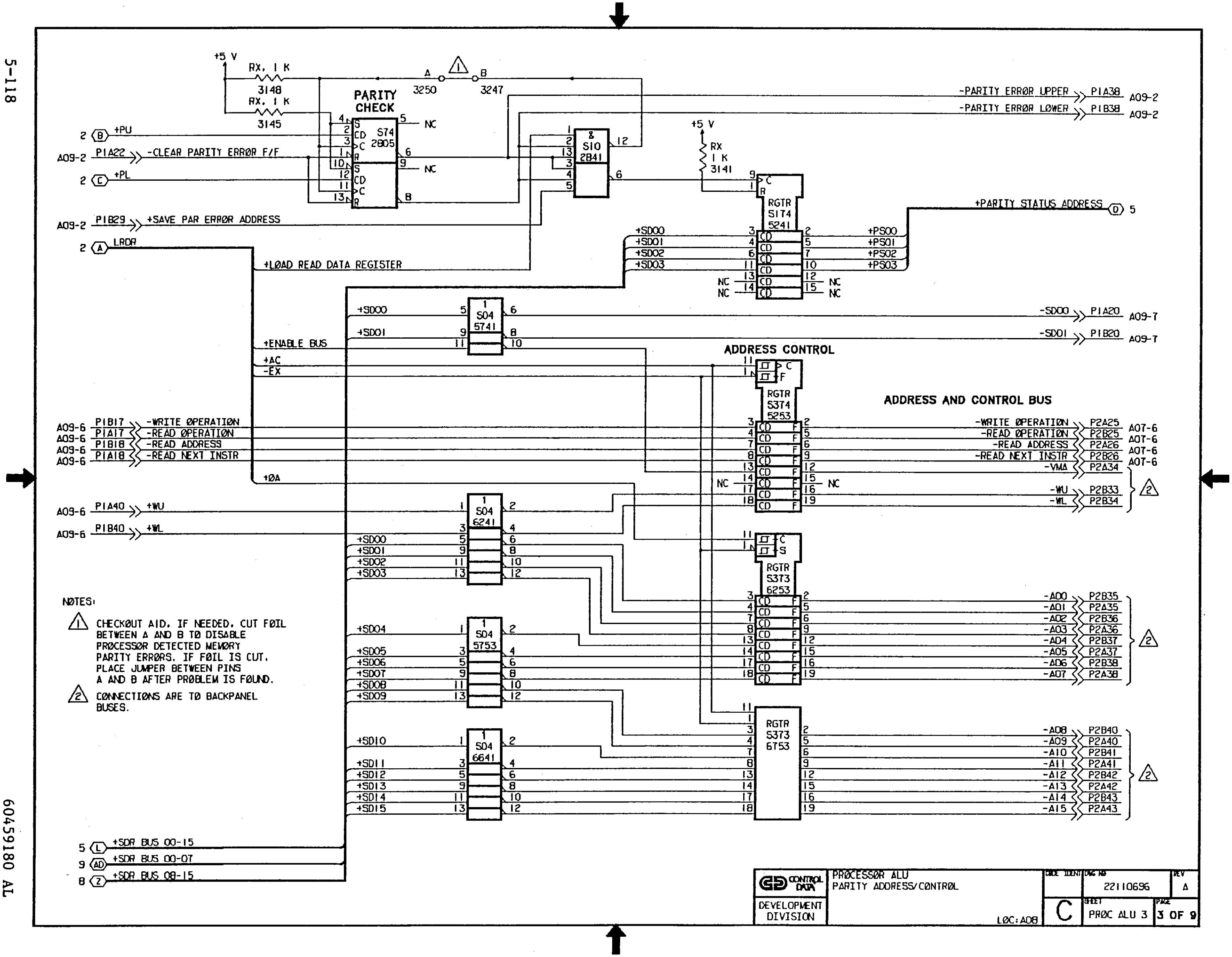


CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR ALU
READ, STORE REGISTERS, PARITY
ADDRESS/CONTROL

LOC: A08

CODE IDENT	DWG NO	REV
C	22110696	A
	SHEET PROC ALU 2	PAGE 2 OF 9

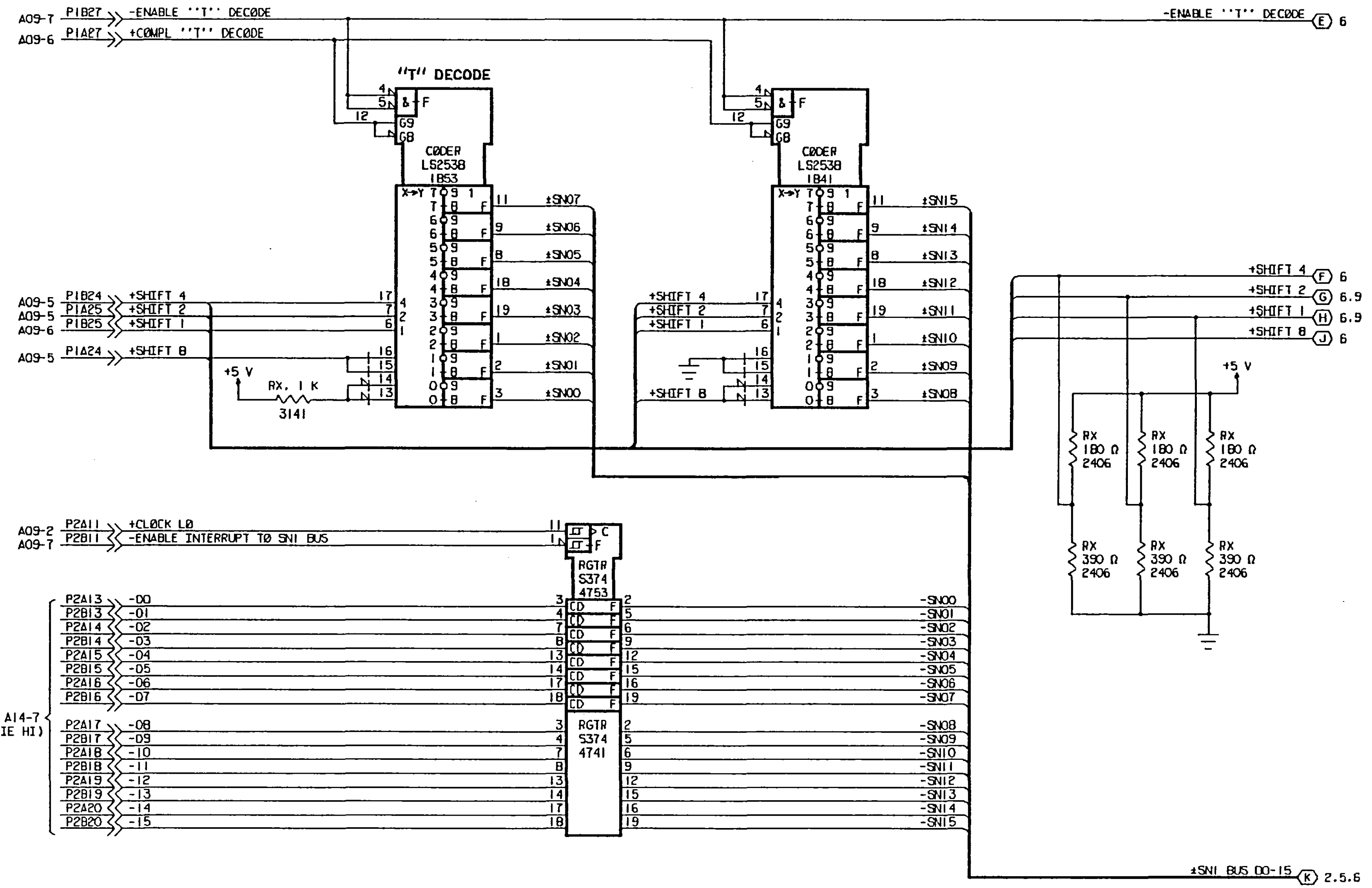


NOTES:

1. CHECKOUT AID. IF NEEDED, CUT FOIL BETWEEN A AND B TO DISABLE PROCESSOR DETECTED MEMORY PARITY ERRORS. IF FOIL IS CUT, PLACE JUMPER BETWEEN PINS A AND B AFTER PROBLEM IS FOUND.

2. CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA DEVELOPMENT DIVISION	PROCESSOR ALU PARITY ADDRESS/CONTROL LOC: A08	CODE IDENT	DWG NO 22110696	REV A
		C	SHEET PROC ALU 3	PAGE 3 OF 9



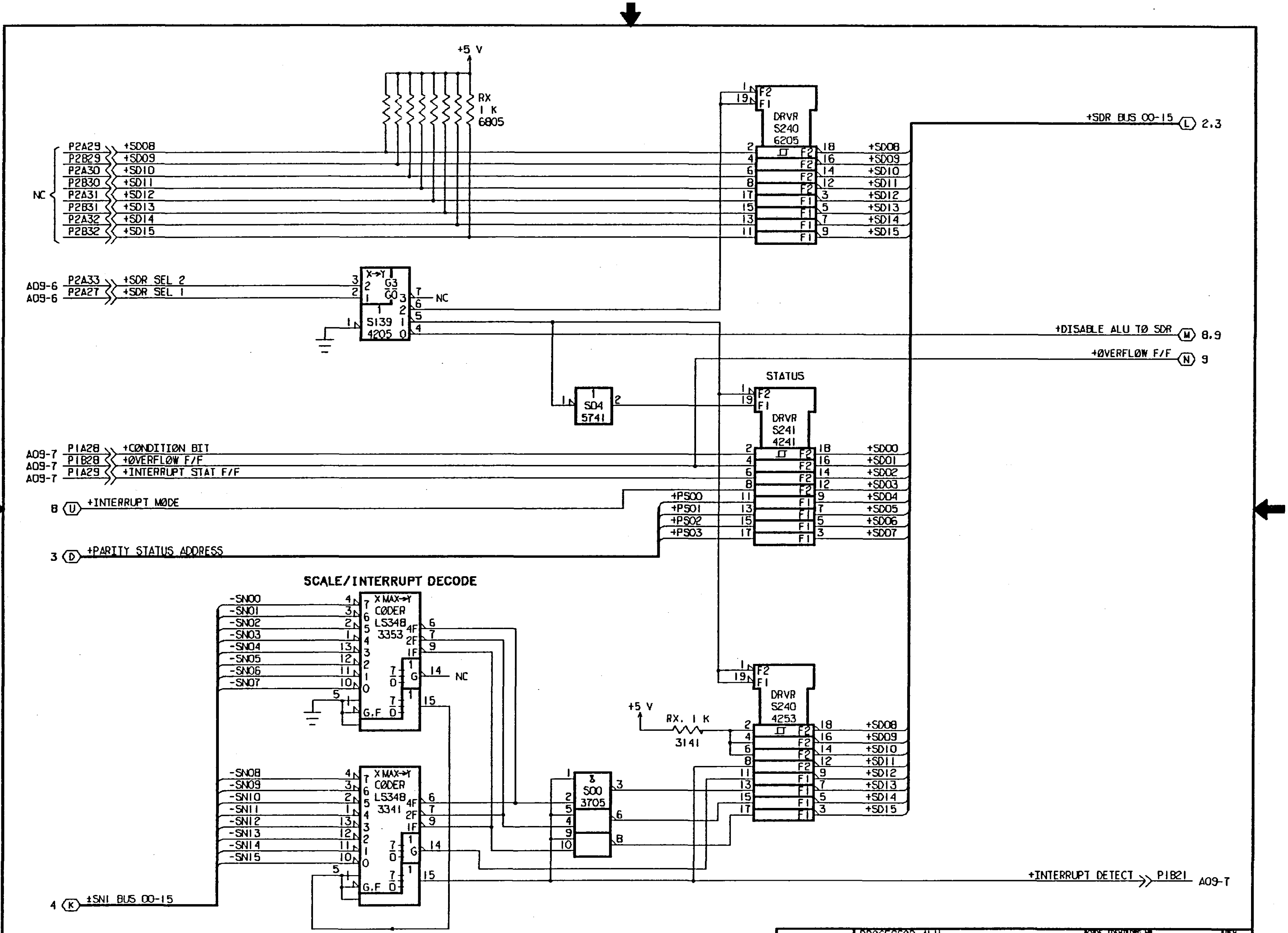
CONTROL DATA

DEVELOPMENT DIVISION

PRØCESSØR ALU
T DECØDE, INTERRUPT REGISTER,
SCALE/INTERRUPT DECØDE, STATUS

LØC:A08

CODE IDENT	DWG NO	REV
C	22110696	A
	SHEET PRØC ALU 4	PAGE 4 OF 9

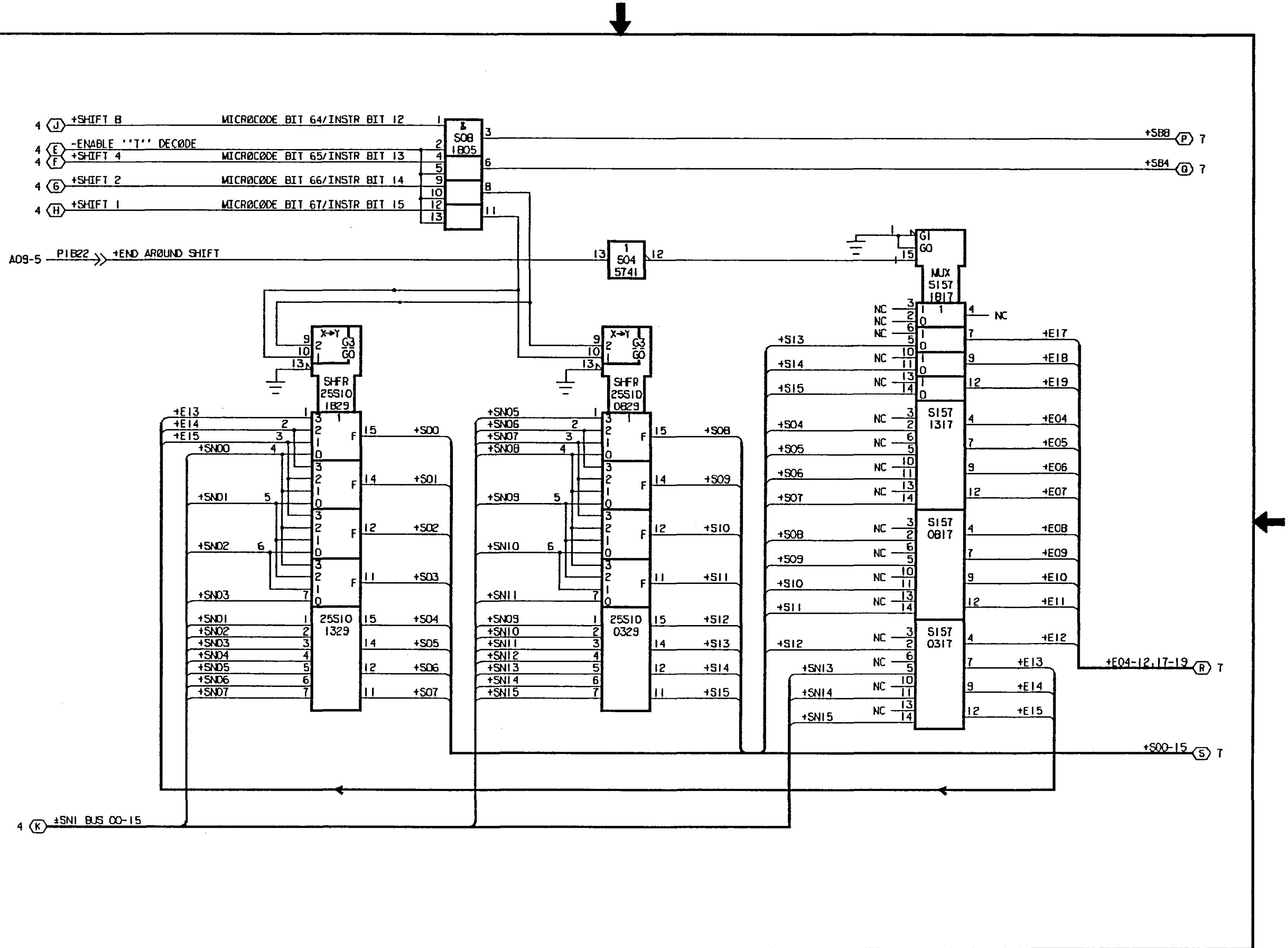


CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR ALU
T DECODE. INTERRUPT REGISTER.
SCALE/INTERRUPT DECODE. STATUS

LOC:A08

CODE IDENT	DWG NO	REV
C	22110696	A
	SHEET PROC ALU 5	PAGE 5 OF 9


4 J +SHIFT 8 MICROCODE BIT 64/INSTR BIT 12
4 E -ENABLE ''T'' DECODE
4 F +SHIFT 4 MICROCODE BIT 65/INSTR BIT 13
4 G +SHIFT 2 MICROCODE BIT 66/INSTR BIT 14
4 H +SHIFT 1 MICROCODE BIT 67/INSTR BIT 15
& S08 1B05
+SB8 P 7
+SB4 Q 7
A09-5 P1B22 +END AROUND SHIFT
S04 5741
MUX S157 1817
G1 G0
NC
X→Y G3 G0
SHFR 25S10 1829
SHFR 25S10 0829
25S10 1329
25S10 0329
S157 1317
S157 0817
S157 0317
+E13 +E14 +E15
+SN00 +SN01 +SN02 +SN03 +SN04 +SN05 +SN06 +SN07
+SN08 +SN09 +SN10 +SN11 +SN12 +SN13 +SN14 +SN15
+S00 +S01 +S02 +S03 +S04 +S05 +S06 +S07
+S08 +S09 +S10 +S11 +S12 +S13 +S14 +S15
+E17 +E18 +E19
+E04 +E05 +E06 +E07 +E08 +E09 +E10 +E11 +E12
+E13 +E14 +E15
+E04-12,17-19 R T
+S00-15 S T
4 K ±SNI BUS 00-15

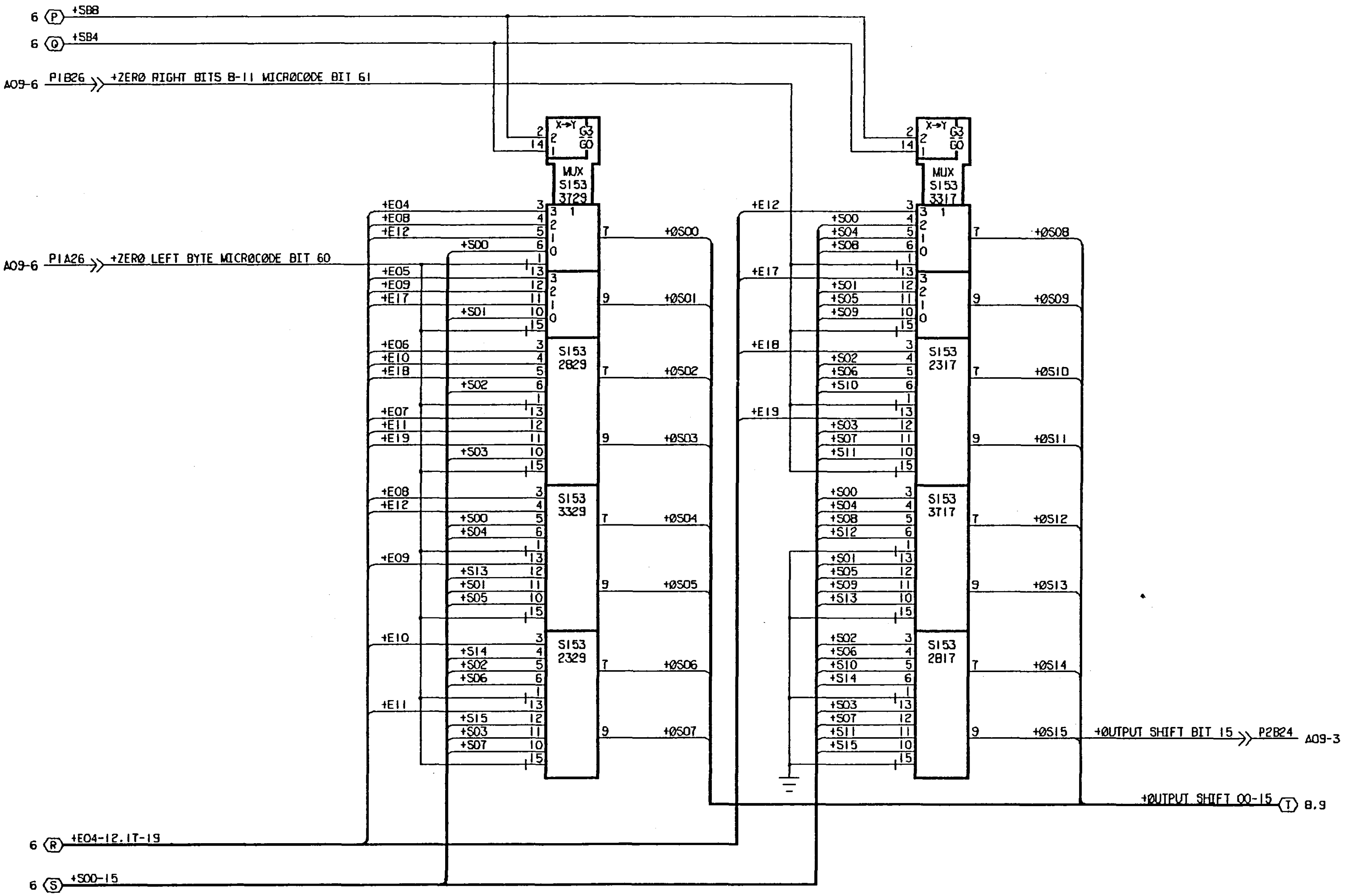
CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR ALU
SHIFT NETWORK

LOC:A08

SIZE	CODE IDENT	DWG NO	REV
C		22110696	A

SHEET	PAGE
PROC ALU 6	8 OF 9

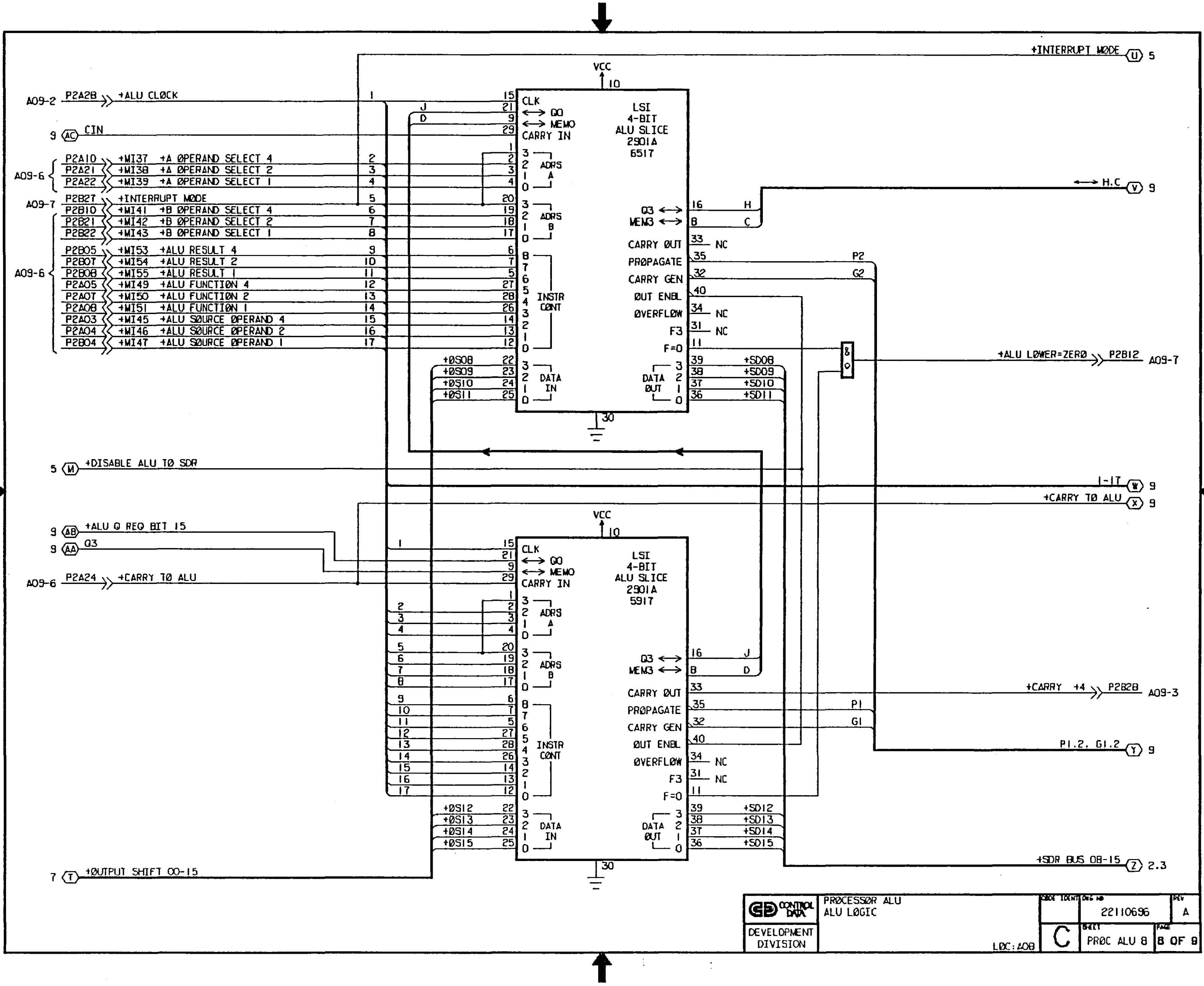


CONTROL DATA
DEVELOPMENT DIVISION

PRØCESSØR ALU
SHIFT NETWØRK

LØC: A08

CODE IDENT	DWG NO	REV
	22110696	A
C	SHEET PRØC ALU 7	PAGE 7 OF 9

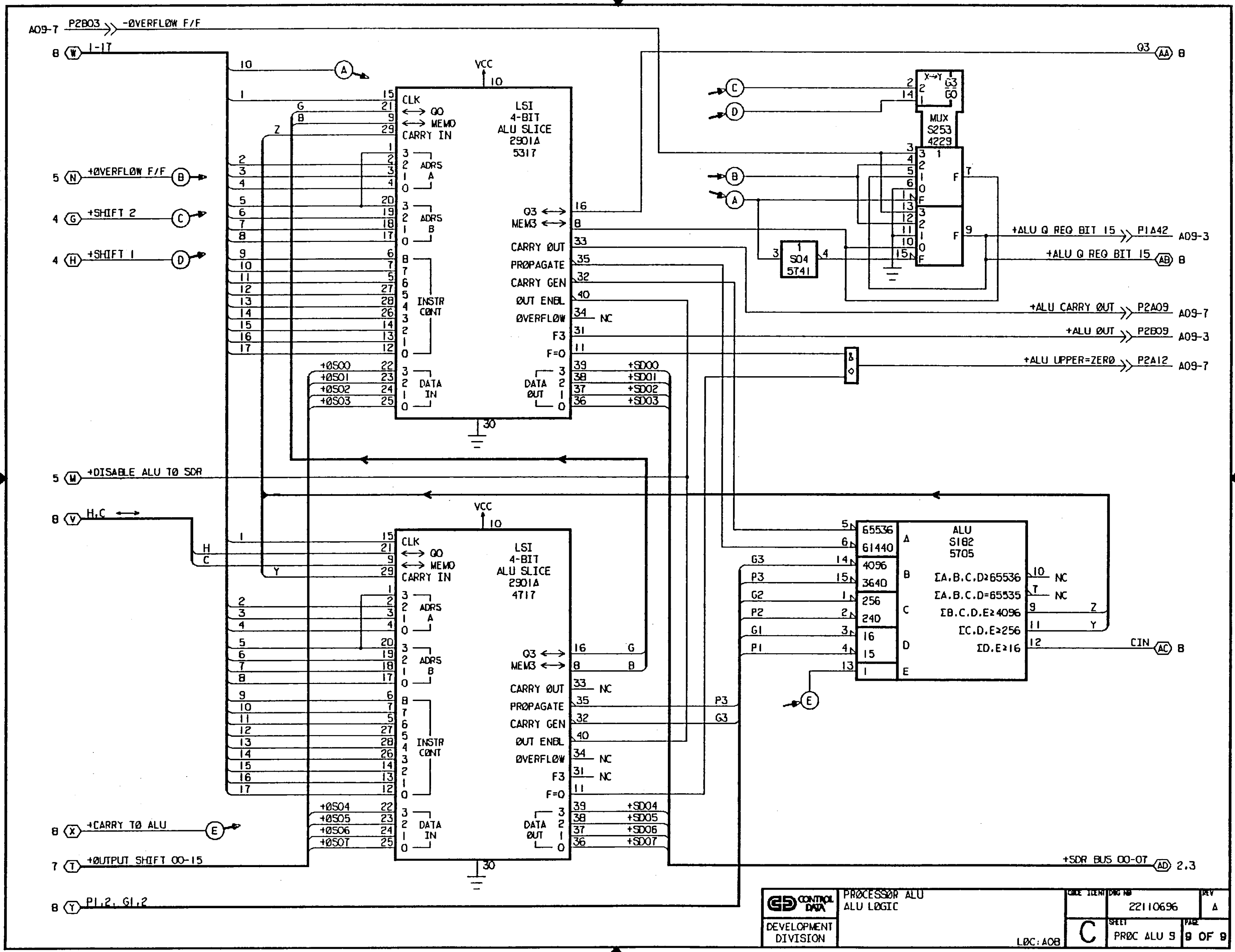

+INTERRUPT MODE (U) 5
VCC
LSI
4-BIT
ALU SLICE
2901A
6517
A09-2 P2A28 +ALU CLOCK
CLK
QO
MEMO
CARRY IN
9 (AC) CIN
A09-6 P2A10 +MI37 +A OPERAND SELECT 4
P2A21 +MI38 +A OPERAND SELECT 2
P2A22 +MI39 +A OPERAND SELECT 1
ADRS A
A09-7 P2B27 +INTERRUPT MODE
P2B10 +MI41 +B OPERAND SELECT 4
P2B21 +MI42 +B OPERAND SELECT 2
P2B22 +MI43 +B OPERAND SELECT 1
ADRS B
A09-6 P2B05 +MI53 +ALU RESULT 4
P2B07 +MI54 +ALU RESULT 2
P2B08 +MI55 +ALU RESULT 1
P2A05 +MI49 +ALU FUNCTION 4
P2A07 +MI50 +ALU FUNCTION 2
P2A08 +MI51 +ALU FUNCTION 1
P2A03 +MI45 +ALU SOURCE OPERAND 4
P2A04 +MI46 +ALU SOURCE OPERAND 2
P2B04 +MI47 +ALU SOURCE OPERAND 1
INSTR CONT
+0S08
+0S09
+0S10
+0S11
DATA IN
DATA OUT
+SD08
+SD09
+SD10
+SD11
Q3
MEM3
H.C (V) 9
CARRY OUT NC
PROPAGATE P2
CARRY GEN G2
OUT ENBL
OVERFLOW NC
F3 NC
F=0
+ALU LOWER=ZERO P2B12 A09-7
5 (M) +DISABLE ALU TO SDR
I-17 (W) 9
+CARRY TO ALU (X) 9
VCC
LSI
4-BIT
ALU SLICE
2901A
5917
9 (AB) +ALU Q REG BIT 15
9 (AA) Q3
A09-6 P2A24 +CARRY TO ALU
+CARRY +4 P2B28 A09-3
PROPAGATE P1
CARRY GEN G1
P1.2, G1.2 (Y) 9
+0S12
+0S13
+0S14
+0S15
+SD12
+SD13
+SD14
+SD15
+SDR BUS 08-15 (Z) 2.3
7 (T) +OUTPUT SHIFT 00-15

CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR ALU
ALU LOGIC

LOC: A08

CODE IDENT
DWG NO 22110696
REV A
SIZE C
SHEET PROC ALU 8
PAGE 8 OF 9



CONTROL DATA

DEVELOPMENT DIVISION

PROCESSOR ALU
ALU LOGIC

LOC:A08

CODE IDENT DWG NO 22110696 REV A

C

SHEET PROC ALU 9 PAGE 9 OF 9

PAGE							REVISION RECORD					
7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A		CLASS A RELEASE	MES	02/88	KMS	KMS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	02/88
CHKD	K M STARIHA	02/88
ENGR	M R KAISER	02/88
MFG		
APVD	L B ULFIG	02/88

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
PROCESSOR CONTROL

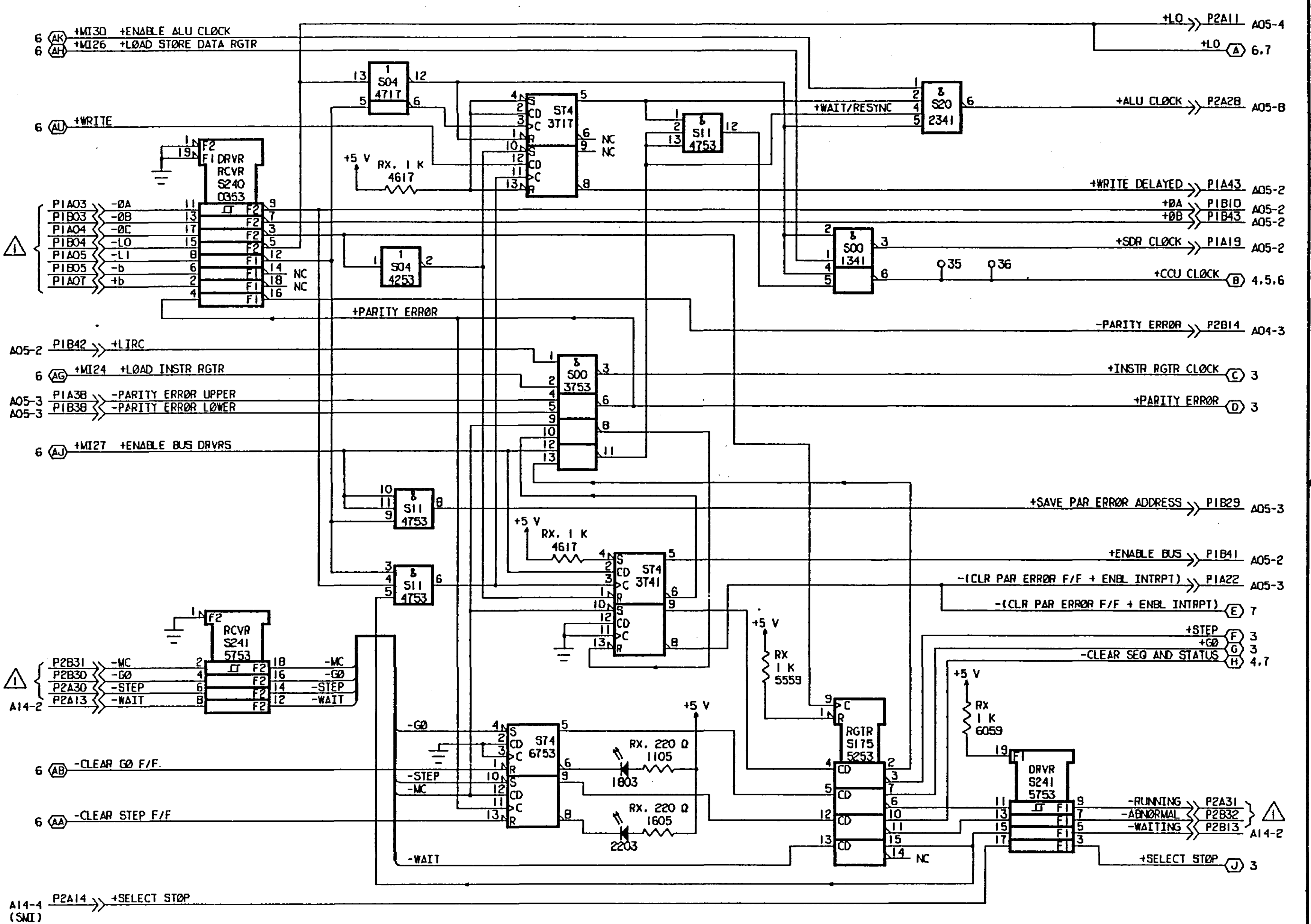
PWA-10292489 PWB-52803440

SIZE C FSCM NO. 34010 DWG NO. 10292490

LOC: A09 SHEET PROC CONT 1B PAGE 1 OF 7

CALMA

CSIZECOVER2



NOTES:
⚠ CONNECTIONS ARE TO BACKPANEL BUSES.

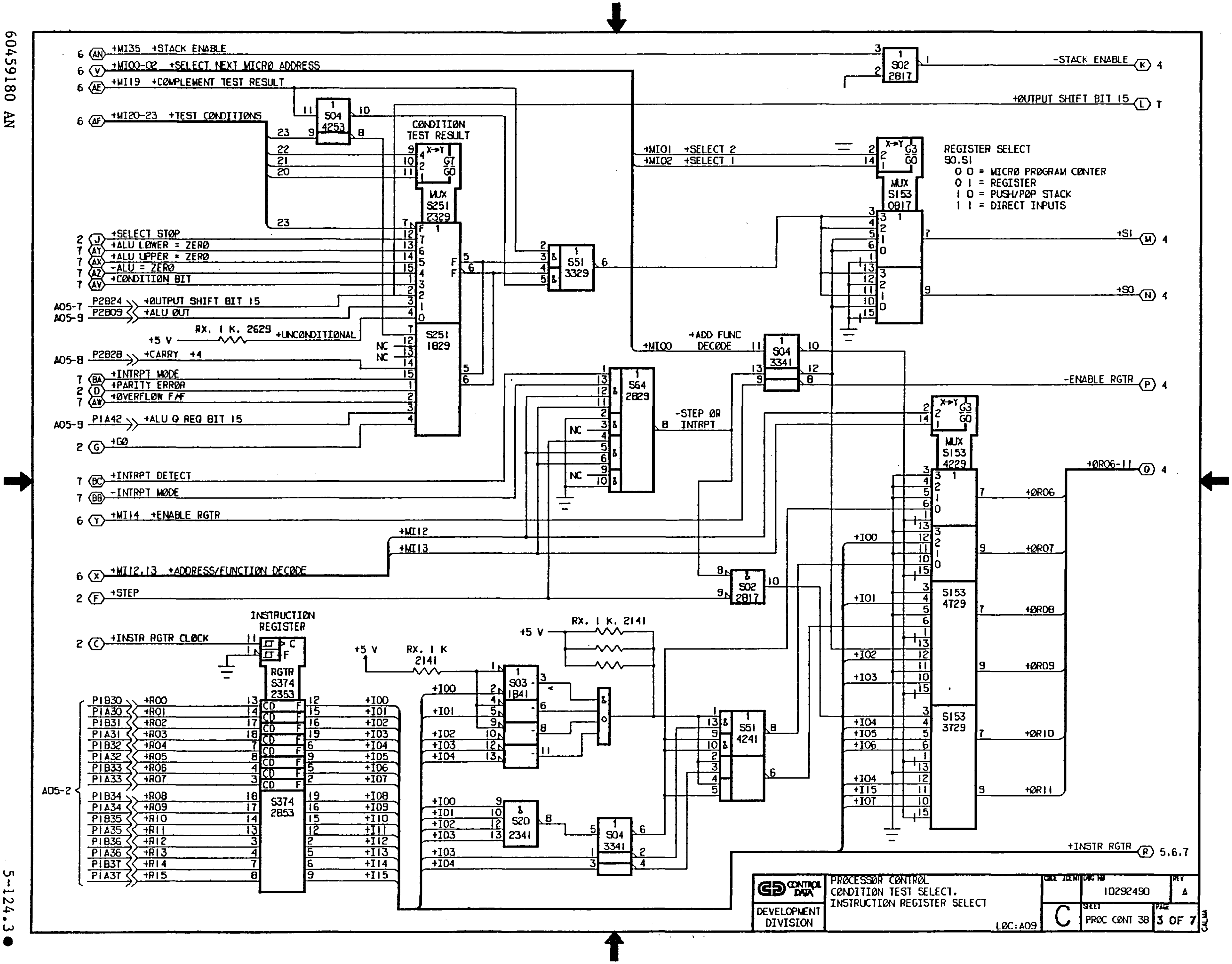
CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR CONTROL
CLOCKS, MASTER CLEAR, WAITING,
STEP, GO

LOC: A09

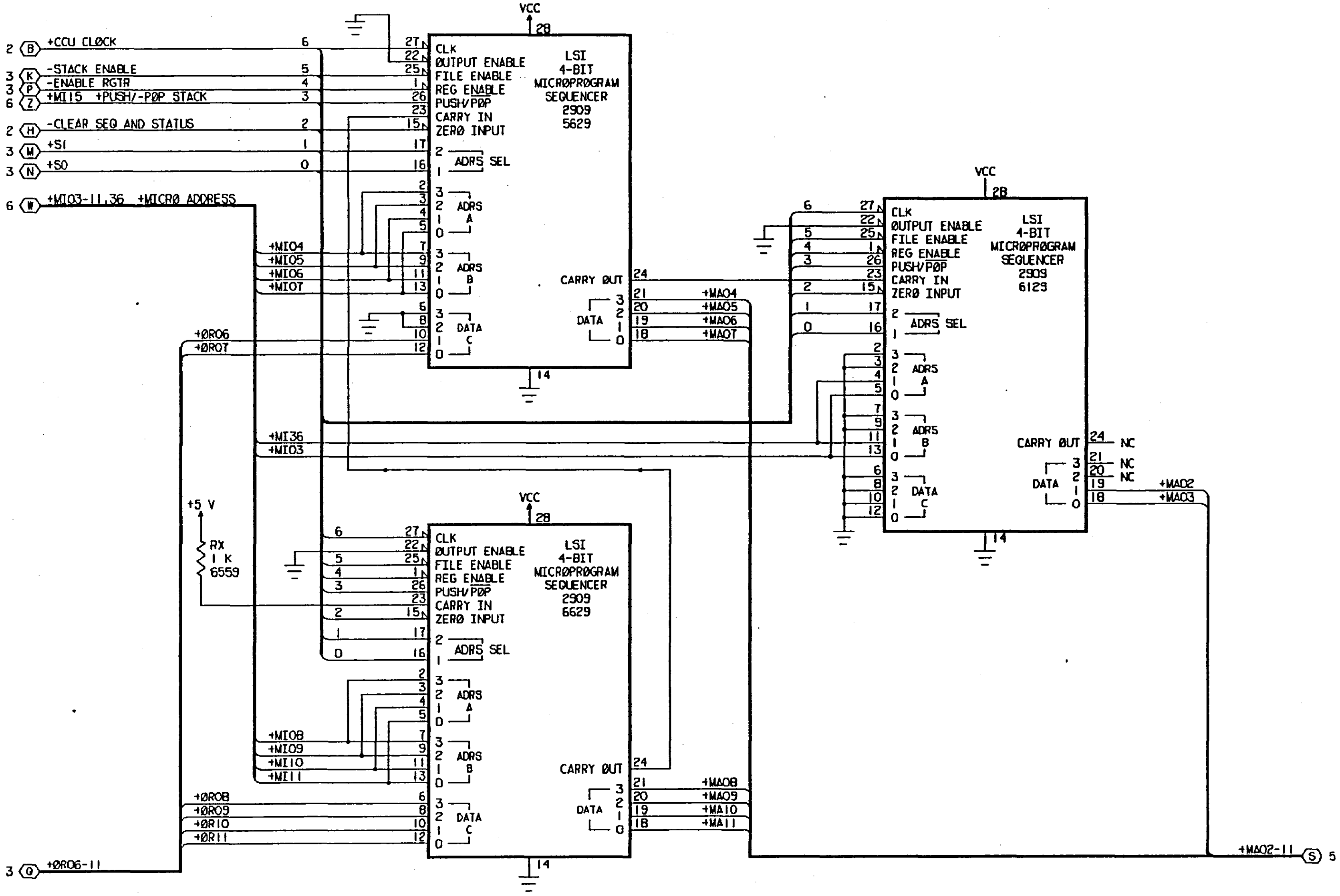
CODE IDENT	DWG NO	REV
	10292490	A
C	SHEET PROC CONT 2B	PAGE 2 OF 7

CALMA



CONTROL DATA
DEVELOPMENT DIVISION
PROCESSOR CONTROL
CONDITION TEST SELECT,
INSTRUCTION REGISTER SELECT
LOC: A09
DWG NO 10292490
REV A
C
SHEET PROC CONT 3B
3 OF 7

5-124.4



CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR CONTROL
MICRO SEQUENCER

LOC: A09

C

10292490

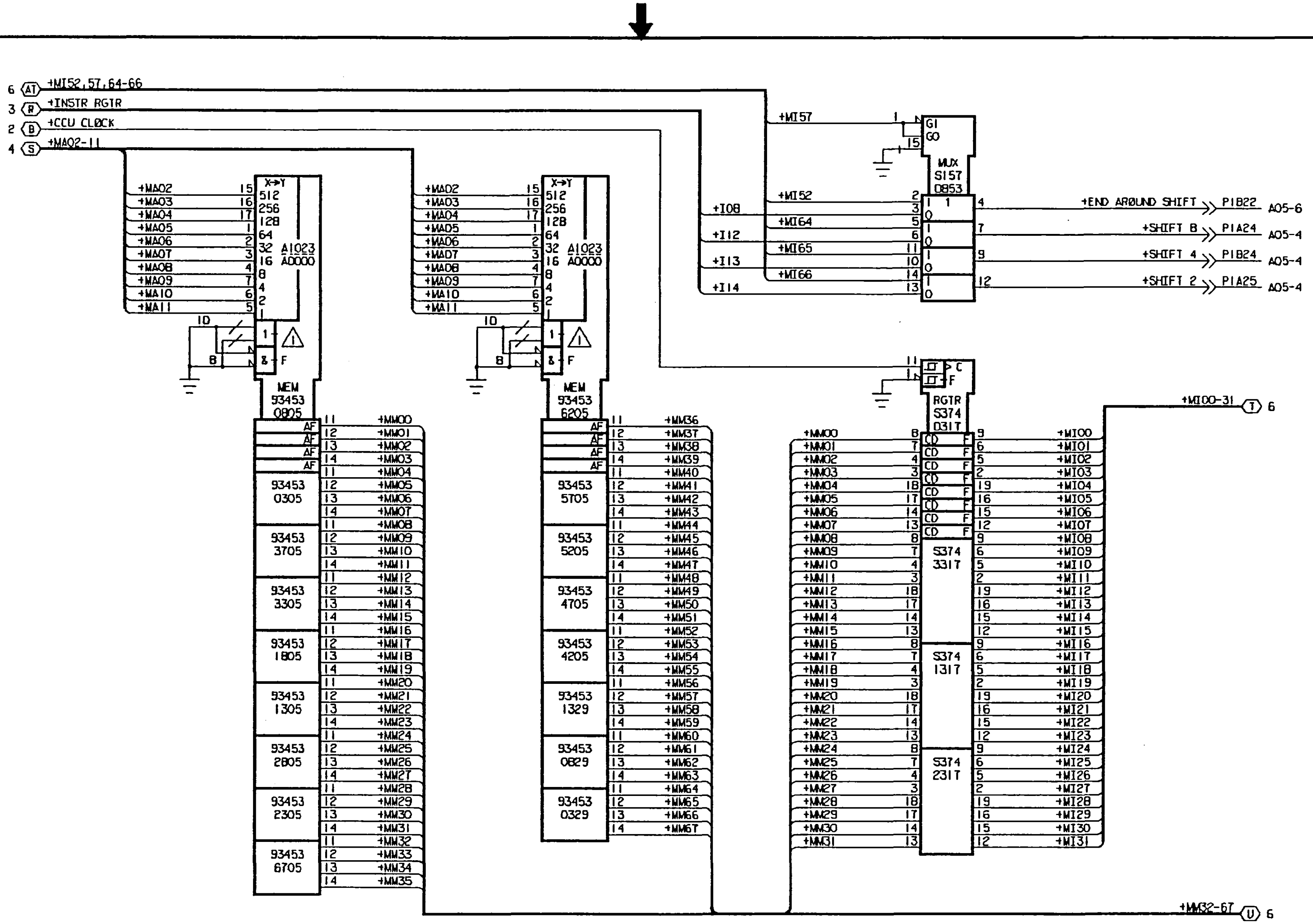
A

PROC CONT 4B

4 OF 7

60459180 AN

60459180 AN



NOTES:

⚠ PIN 10 ALSO USED IN PROGRAMMING.

CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR CONTROL
MICROCODE MEMORY

LOC:A09

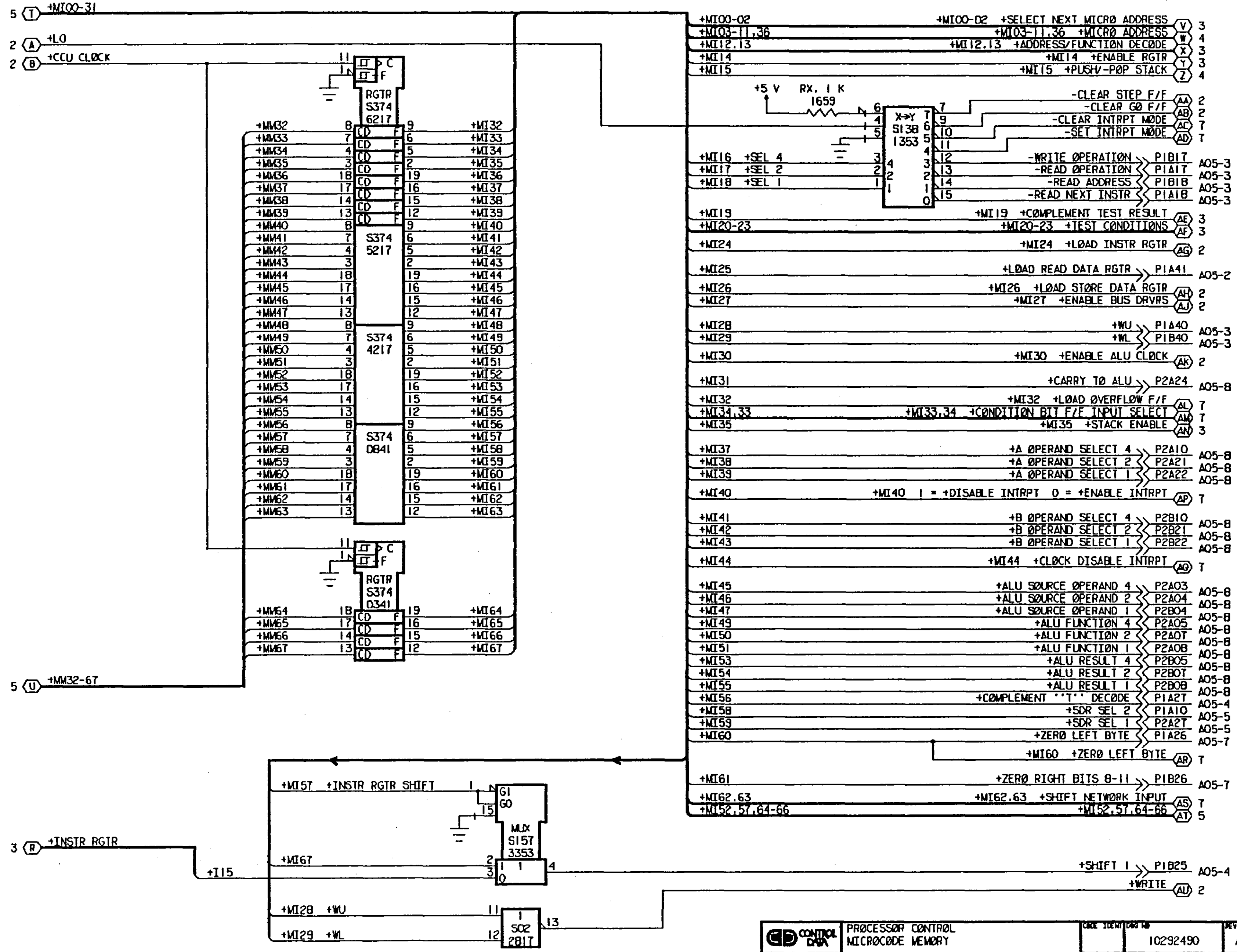
C

10292490

A

PROC CONT 5B

5 OF 7


5 (T) +MI00-31
2 (A) +L0
2 (B) +CCU CLOCK
RGTR S374 6217
C F
+MM32 8 9 +MI32
+MM33 7 6 +MI33
+MM34 4 5 +MI34
+MM35 3 2 +MI35
+MM36 18 19 +MI36
+MM37 17 16 +MI37
+MM38 14 15 +MI38
+MM39 13 12 +MI39
+MM40 8 9 +MI40
+MM41 7 6 +MI41
+MM42 4 5 +MI42
+MM43 3 2 +MI43
+MM44 18 19 +MI44
+MM45 17 16 +MI45
+MM46 14 15 +MI46
+MM47 13 12 +MI47
S374 5217
+MM48 8 9 +MI48
+MM49 7 6 +MI49
+MM50 4 5 +MI50
+MM51 3 2 +MI51
+MM52 18 19 +MI52
+MM53 17 16 +MI53
+MM54 14 15 +MI54
+MM55 13 12 +MI55
S374 4217
+MM56 8 9 +MI56
+MM57 7 6 +MI57
+MM58 4 5 +MI58
+MM59 3 2 +MI59
+MM60 18 19 +MI60
+MM61 17 16 +MI61
+MM62 14 15 +MI62
+MM63 13 12 +MI63
S374 D841
CD F
RGTR S374 D341
+MM64 18 19 +MI64
+MM65 17 16 +MI65
+MM66 14 15 +MI66
+MM67 13 12 +MI67
5 (U) +MM32-67
+MI00-02 +MI00-02 +SELECT NEXT MICRO ADDRESS (V) 3
+MI03-11,36 +MI03-11,36 +MICRO ADDRESS (W) 4
+MI12,13 +MI12,13 +ADDRESS/FUNCTION DECODE (X) 3
+MI14 +MI14 +ENABLE RGTR (Y) 3
+MI15 +MI15 +PUSH/-POP STACK (Z) 4
+5 V RX, 1 K 1659
X→Y S138 1353
-CLEAR STEP F/F (AA) 2
-CLEAR GO F/F (AB) 2
-CLEAR INTRPT MODE (AC) 7
-SET INTRPT MODE (AD) 7
+MI16 +SEL 4 -WRITE OPERATION P1B17 A05-3
+MI17 +SEL 2 -READ OPERATION P1A17 A05-3
+MI18 +SEL 1 -READ ADDRESS P1B18 A05-3
-READ NEXT INSTR P1A18 A05-3
+MI19 +MI19 +COMPLEMENT TEST RESULT (AE) 3
+MI20-23 +MI20-23 +TEST CONDITIONS (AF) 3
+MI24 +MI24 +LOAD INSTR RGTR (AG) 2
+MI25 +LOAD READ DATA RGTR P1A41 A05-2
+MI26 +MI26 +LOAD STORE DATA RGTR (AH) 2
+MI27 +MI27 +ENABLE BUS DRVRS (AJ) 2
+MI28 +WU P1A40 A05-3
+MI29 +WL P1B40 A05-3
+MI30 +MI30 +ENABLE ALU CLOCK (AK) 2
+MI31 +CARRY TO ALU P2A24 A05-8
+MI32 +MI32 +LOAD OVERFLOW F/F (AL) 7
+MI34,33 +MI33,34 +CONDITION BIT F/F INPUT SELECT (AM) 7
+MI35 +MI35 +STACK ENABLE (AN) 3
+MI37 +A OPERAND SELECT 4 P2A10 A05-8
+MI38 +A OPERAND SELECT 2 P2A21 A05-8
+MI39 +A OPERAND SELECT 1 P2A22 A05-8
+MI40 +MI40 1 = +DISABLE INTRPT 0 = +ENABLE INTRPT (AP) 7
+MI41 +B OPERAND SELECT 4 P2B10 A05-8
+MI42 +B OPERAND SELECT 2 P2B21 A05-8
+MI43 +B OPERAND SELECT 1 P2B22 A05-8
+MI44 +MI44 +CLOCK DISABLE INTRPT (AQ) 7
+MI45 +ALU SOURCE OPERAND 4 P2A03 A05-8
+MI46 +ALU SOURCE OPERAND 2 P2A04 A05-8
+MI47 +ALU SOURCE OPERAND 1 P2B04 A05-8
+MI49 +ALU FUNCTION 4 P2A05 A05-8
+MI50 +ALU FUNCTION 2 P2A07 A05-8
+MI51 +ALU FUNCTION 1 P2A08 A05-8
+MI53 +ALU RESULT 4 P2B05 A05-8
+MI54 +ALU RESULT 2 P2B07 A05-8
+MI55 +ALU RESULT 1 P2B08 A05-8
+MI56 +COMPLEMENT ''T'' DECODE P1A27 A05-4
+MI58 +SDR SEL 2 P1A10 A05-5
+MI59 +SDR SEL 1 P2A27 A05-5
+MI60 +ZERO LEFT BYTE P1A26 A05-7
+MI60 +ZERO LEFT BYTE (AR) 7
+MI61 +ZERO RIGHT BITS 8-11 P1B26 A05-7
+MI62,63 +MI62,63 +SHIFT NETWORK INPUT (AS) 7
+MI52,57,64-66 +MI52,57,64-66 (AT) 5
+MI57 +INSTR RGTR SHIFT
G1 G0 MUX S157 3353
3 (R) +INSTR RGTR
+I15
+MI67
+SHIFT 1 P1B25 A05-4
+WRITE (AU) 2
+MI28 +WU
+MI29 +WL
S02 2817

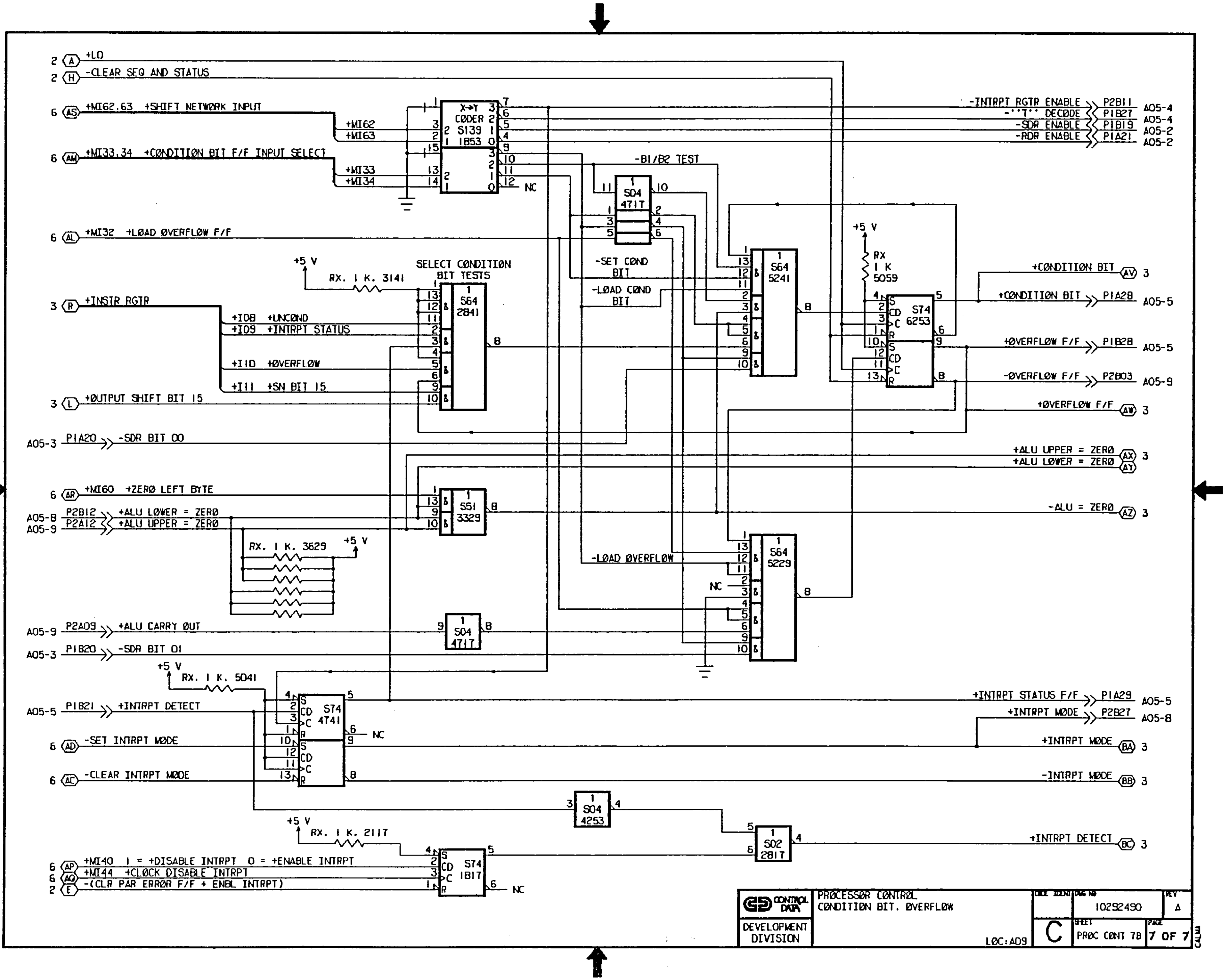
CONTROL DATA

DEVELOPMENT DIVISION

PROCESSOR CONTROL
MICROCODE MEMORY

LOC:A09

CODE IDENT	DWG NO	REV
C	10292490	A
	SHEET PROC CONT 6B	PAGE 6 OF 7


2 A +LD
2 H -CLEAR SEQ AND STATUS
6 AS +MI62.63 +SHIFT NETWORK INPUT
+MI62
+MI63
6 AM +MI33.34 +CONDITION BIT F/F INPUT SELECT
+MI33
+MI34
X→Y CODER S139 1853
-INTRPT RGTR ENABLE P2B11 A05-4
-"T" DECODE P1B27 A05-4
-SDR ENABLE P1B19 A05-2
-RDR ENABLE P1A21 A05-2
NC
-B1/B2 TEST
S04 4717
6 AL +MI32 +LOAD OVERFLOW F/F
+5 V
RX. 1 K. 3141
SELECT CONDITION BIT TESTS
S64 2841
-SET COND BIT
-LOAD COND BIT
S64 5241
+5 V
RX 1 K 5059
S74 6253
+CONDITION BIT AV 3
+CONDITION BIT P1A28 A05-5
3 R +INSTR RGTR
+I08 +UNCOND
+I09 +INTRPT STATUS
+I10 +OVERFLOW
+I11 +SN BIT 15
3 L +OUTPUT SHIFT BIT 15
+OVERFLOW F/F P1B28 A05-5
-OVERFLOW F/F P2B03 A05-9
+OVERFLOW F/F AW 3
A05-3 P1A20 -SDR BIT 00
+ALU UPPER = ZERO AX 3
+ALU LOWER = ZERO AY
6 AR +MI60 +ZERO LEFT BYTE
A05-8 P2B12 +ALU LOWER = ZERO
A05-9 P2A12 +ALU UPPER = ZERO
S51 3329
-ALU = ZERO AZ 3
RX. 1 K. 3629
+5 V
-LOAD OVERFLOW
S64 5229
NC
A05-9 P2A09 +ALU CARRY OUT
S04 4717
A05-3 P1B20 -SDR BIT 01
+5 V
RX. 1 K. 5041
A05-5 P1B21 +INTRPT DETECT
S74 4T41
NC
+INTRPT STATUS F/F P1A29 A05-5
+INTRPT MODE P2B27 A05-8
6 AD -SET INTRPT MODE
+INTRPT MODE BA 3
6 AC -CLEAR INTRPT MODE
-INTRPT MODE BB 3
S04 4253
+5 V
RX. 1 K. 2117
S02 2817
+INTRPT DETECT BC 3
S74 1817
NC
6 AP +MI40 1 = +DISABLE INTRPT 0 = +ENABLE INTRPT
6 AQ +MI44 +CLOCK DISABLE INTRPT
2 E -(CLR PAR ERROR F/F + ENBL INTRPT)
CONTROL DATA
DEVELOPMENT DIVISION
PROCESSOR CONTROL
CONDITION BIT. OVERFLOW
LOC:A09
C
DWG NO 10292490
REV A
SHEET PROC CONT 7B
PAGE 7 OF 7

PAGE							REVISION RECORD					
7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A	CA48908	CLASS A RELEASE	KMS	06/87	NZ	NZ

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	06/87
CHKD	N SAMPSON	06/87
ENGR	B RUSSO	06/87
MFG		
APVD	L B ULFIG	06/87

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

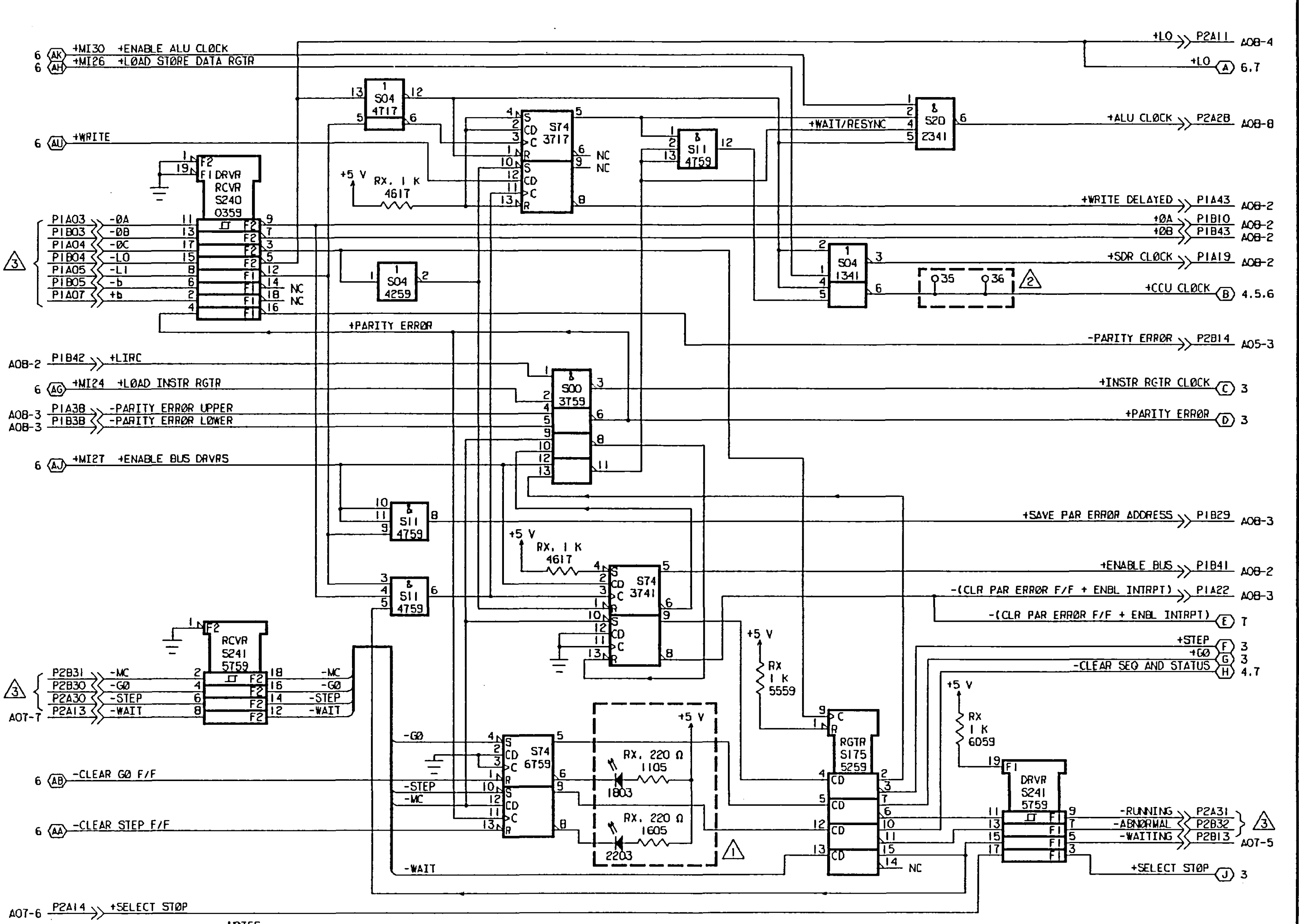
TITLE
LOGIC DIAGRAM PROCESSOR CONTROL

PWA-52803441
PWB-52803440

SIZE C
FSCM NO. 34010
DWG NO. 22110697
LOC. A09
SHEET PROC CONT 1
PAGE 1 OF 7

PROCESSOR CONTROL (A09-2)

The processor control logic processes all instructions of processor arithmetic logic unit, (A08). For details of operation, including the internal instruction set of the processor, refer to appendix B of the CYBER Channel Coupler Hardware Reference Manual (see preface for publication number).



NOTES:

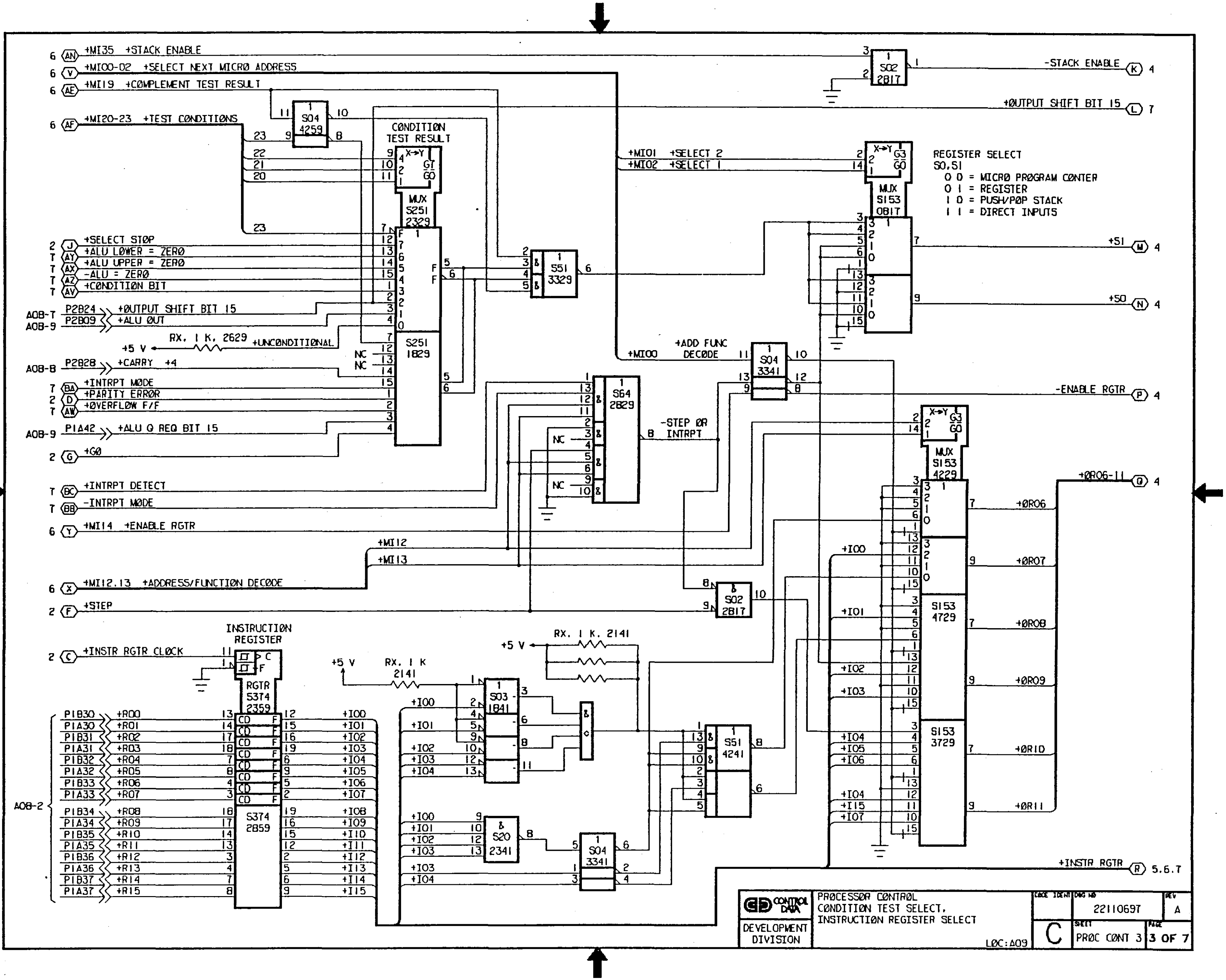
1. CIRCUIT NOT PRESENT ON PWB-53139747.
2. TP'S NOT PRESENT ON PWB-53139747
3. CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR CONTROL
CLOCKS, MASTER CLEAR, WAITING,
STEP, G0

LOC:A09

CODE IDENT	DWG NO	REV
C	22110697	A
	SHEET PROC CONT 2	PAGE 2 OF 7



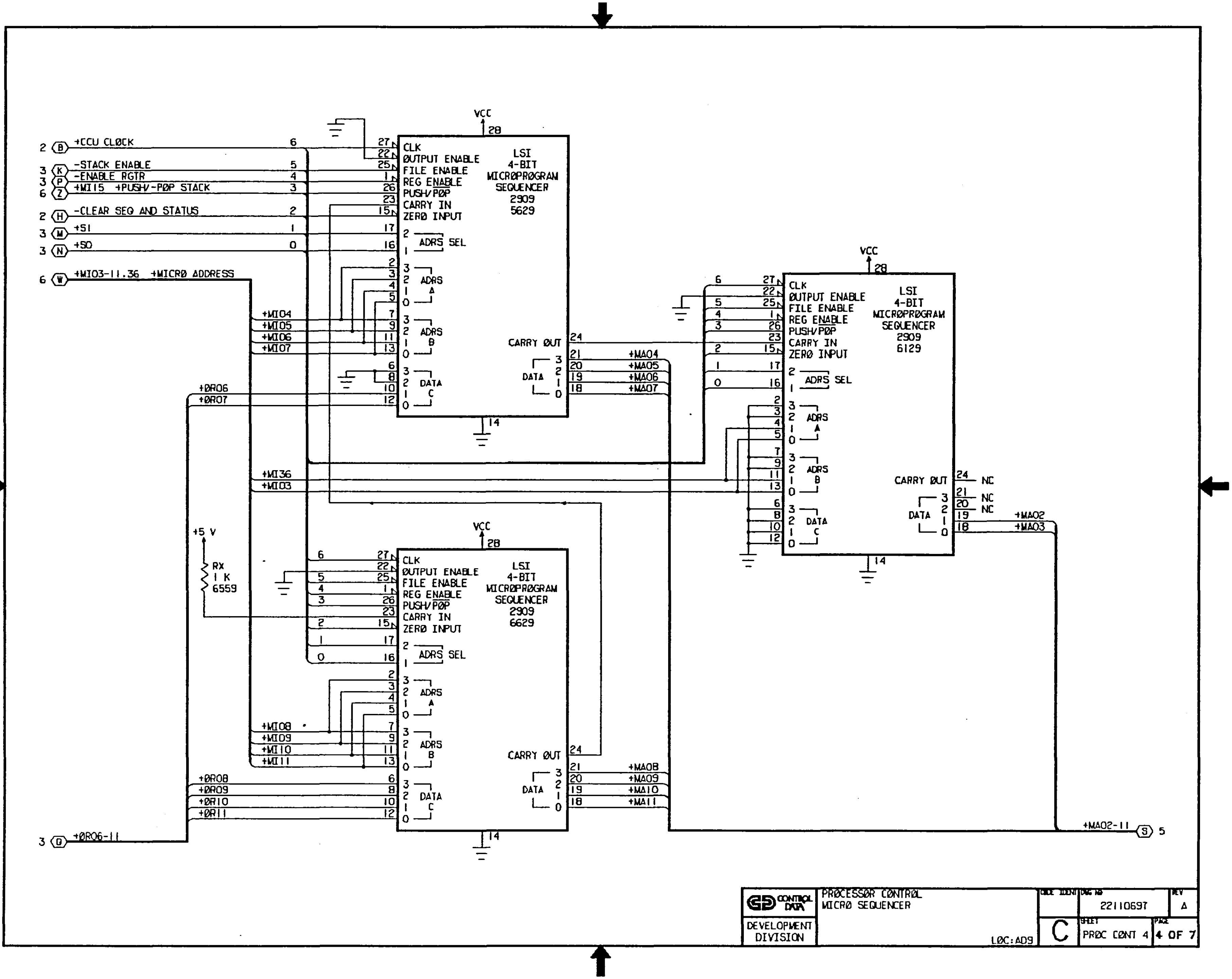
CONTROL DATA

DEVELOPMENT DIVISION

PRØCESSØR CØNTRØL
CØNDITIØN TEST SELECT,
INSTRUCTIØN REGISTER SELECT

LØC:A09

CODE IDENT	DWG NO	REV
C	22110697	A
	SHEET PRØC CØNT 3	PAGE 3 OF 7



CONTROL DATA

DEVELOPMENT DIVISION

PROCESSOR CONTROL MICRO SEQUENCER

LOC:AD9

CODE IDENT

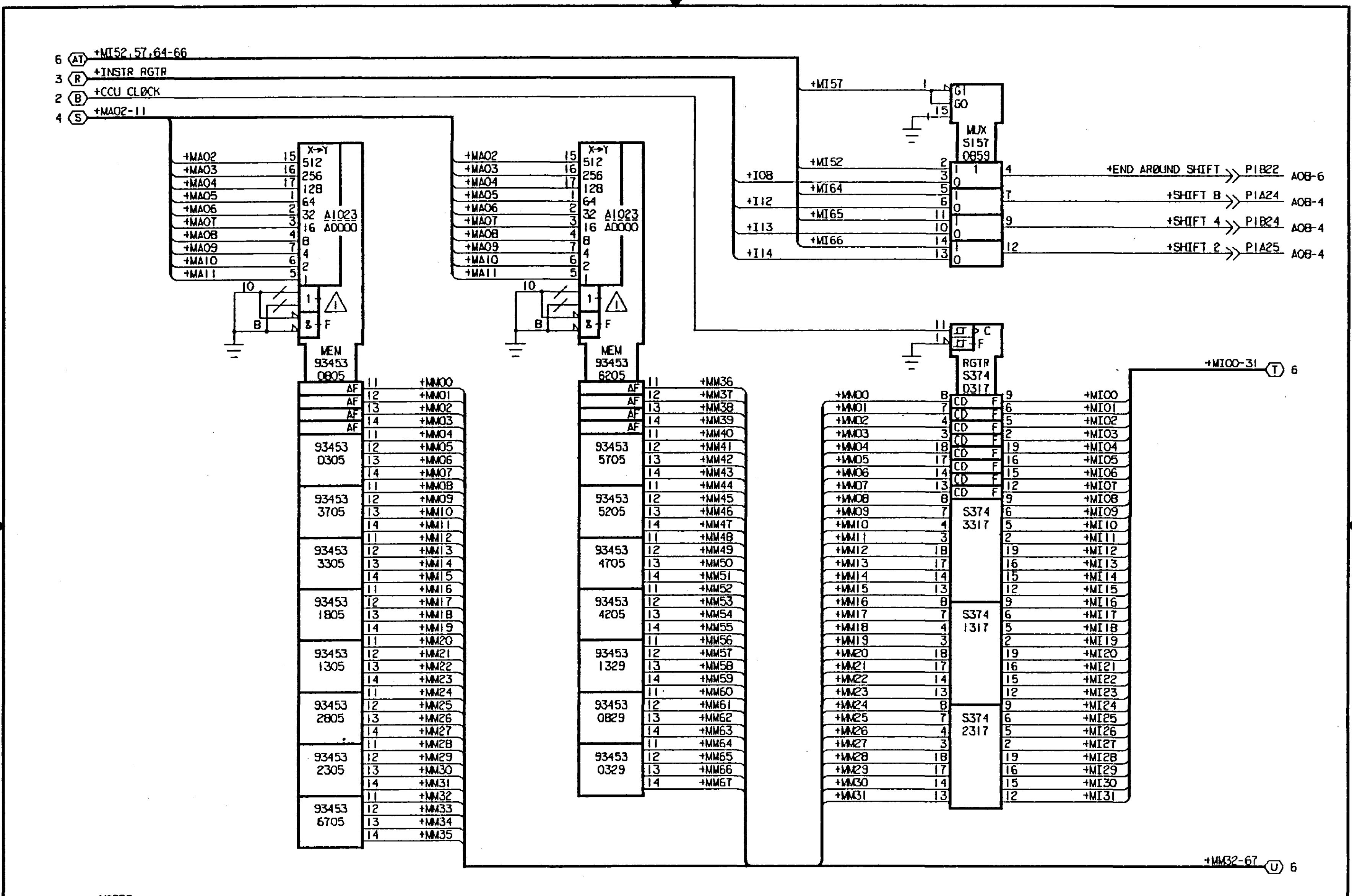
DWG NO 22110697

REV A

SIZE C

SHEET PROC CONT 4

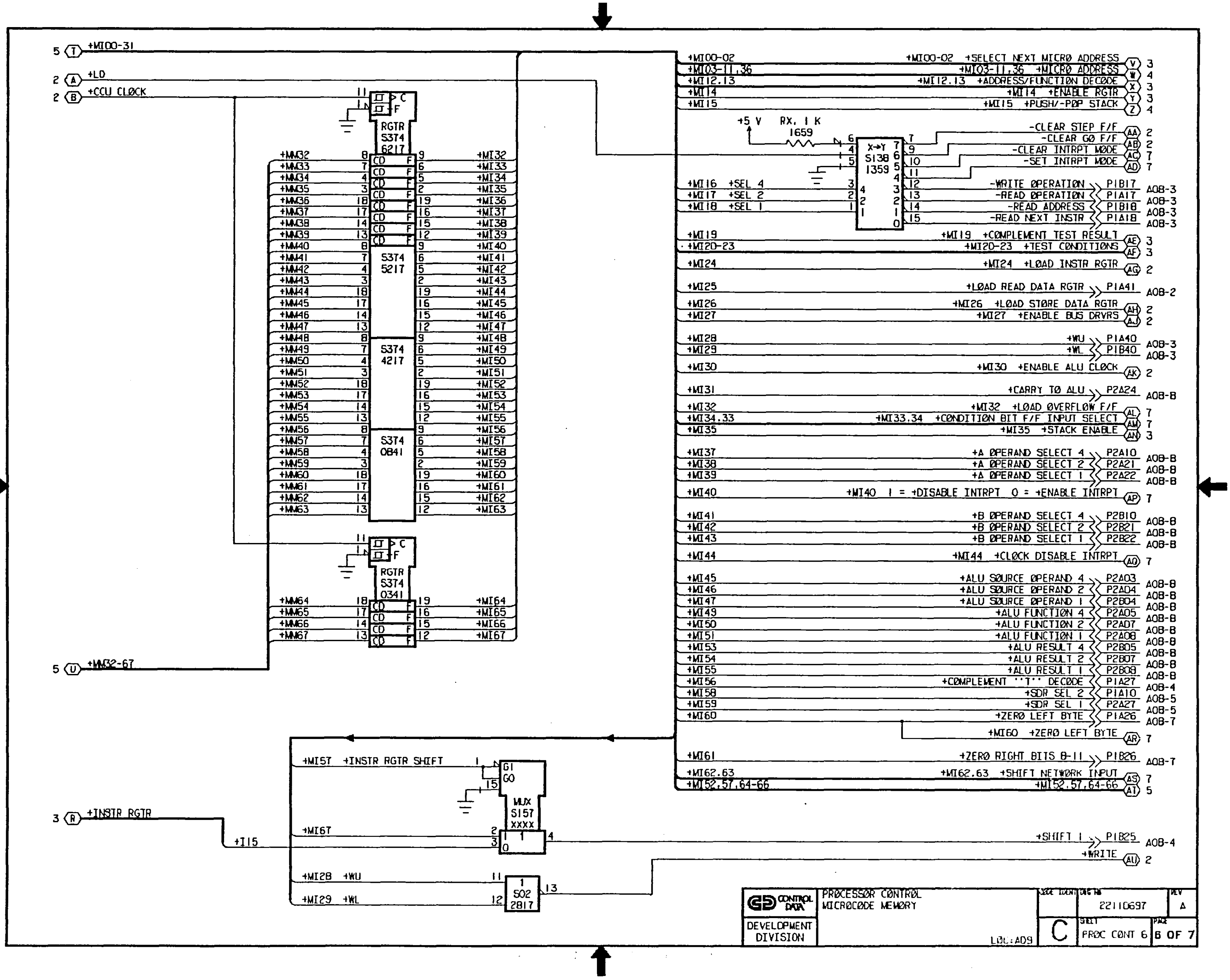
PAGE 4 OF 7



NØTES:

⚠ PIN 10 ALSØ USED IN PRØGRAMMING.

CONTROL DATA	PRØCESSØR CØNTRØL MICRØCØDE MEMØRY	CODE IDENT	DWG NO 22110697	REV A
DEVELOPMENT DIVISION	LØC:AD9	C	SHEET PRØC CØNT 5	PAGE 5 OF 7


5 T +MI00-31
2 A +LD
2 B +CCU CLOCK
RGTR S3T4 6217
S3T4 5217
S3T4 4217
S3T4 0841
RGTR S3T4 0341
5 U +MM32-67
3 R +INSTR RGTR
+I15
+MI57 +INSTR RGTR SHIFT
MUX S157 XXXX
+MI67
+MI28 +WU
+MI29 +WL
S02 2817
+5 V RX, 1 K 1659
X→Y S138 1359
+MI16 +SEL 4
+MI17 +SEL 2
+MI18 +SEL 1
+MI00-02 +SELECT NEXT MICRO ADDRESS V 3
+MI03-11,36 +MICRO ADDRESS W 4
+MI12,13 +ADDRESS/FUNCTION DECODE X 3
+MI14 +ENABLE RGTR Y 3
+MI15 +PUSH/-POP STACK Z 4
-CLEAR STEP F/F AA 2
-CLEAR GO F/F AB 2
-CLEAR INTRPT MODE AC 7
-SET INTRPT MODE AD 7
-WRITE OPERATION P1B17 A08-3
-READ OPERATION P1A17 A08-3
-READ ADDRESS P1B18 A08-3
-READ NEXT INSTR P1A18 A08-3
+MI19 +COMPLEMENT TEST RESULT AE 3
+MI20-23 +TEST CONDITIONS AF 3
+MI24 +LOAD INSTR RGTR AG 2
+LOAD READ DATA RGTR P1A41 A08-2
+MI26 +LOAD STORE DATA RGTR AH 2
+MI27 +ENABLE BUS DRVRS AJ 2
+WU P1A40 A08-3
+WL P1B40 A08-3
+MI30 +ENABLE ALU CLOCK AK 2
+CARRY TO ALU P2A24 A08-8
+MI32 +LOAD OVERFLOW F/F AL 7
+MI33,34 +CONDITION BIT F/F INPUT SELECT AM 7
+MI35 +STACK ENABLE AN 3
+A OPERAND SELECT 4 P2A10 A08-8
+A OPERAND SELECT 2 P2A21 A08-8
+A OPERAND SELECT 1 P2A22 A08-8
+MI40 1 = +DISABLE INTRPT 0 = +ENABLE INTRPT AP 7
+B OPERAND SELECT 4 P2B10 A08-8
+B OPERAND SELECT 2 P2B21 A08-8
+B OPERAND SELECT 1 P2B22 A08-8
+MI44 +CLOCK DISABLE INTRPT AQ 7
+ALU SOURCE OPERAND 4 P2A03 A08-8
+ALU SOURCE OPERAND 2 P2A04 A08-8
+ALU SOURCE OPERAND 1 P2B04 A08-8
+ALU FUNCTION 4 P2A05 A08-8
+ALU FUNCTION 2 P2A07 A08-8
+ALU FUNCTION 1 P2A08 A08-8
+ALU RESULT 4 P2B05 A08-8
+ALU RESULT 2 P2B07 A08-8
+ALU RESULT 1 P2B08 A08-8
+COMPLEMENT "T" DECODE P1A27 A08-4
+SDR SEL 2 P1A10 A08-5
+SDR SEL 1 P2A27 A08-5
+ZERO LEFT BYTE P1A26 A08-7
+MI60 +ZERO LEFT BYTE AR 7
+ZERO RIGHT BITS 8-11 P1B26 A08-7
+MI62,63 +SHIFT NETWORK INPUT AS 7
+MI52,57,64-66 AT 5
+SHIFT 1 P1B25 A08-4
+WRITE AU 2

CONTROL DATA

DEVELOPMENT DIVISION

PROCESSOR CONTROL
MICROCODE MEMORY

LOC: A09

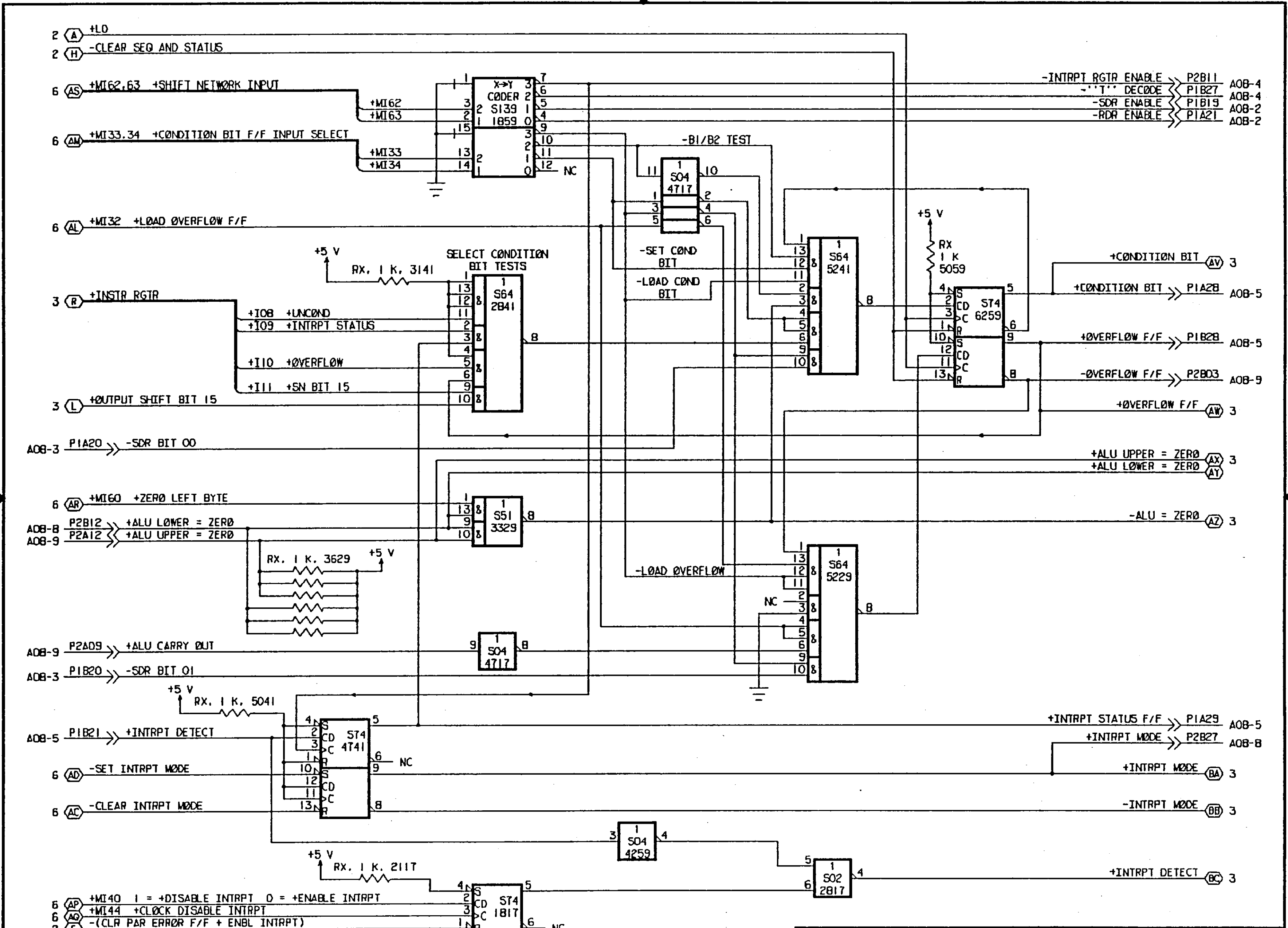
C

22110697

REV A

PROC CONT 6

6 OF 7



CONTROL DATA
DEVELOPMENT DIVISION

PROCESSOR CONTROL
CONDITION BIT, OVERFLOW

LOC:A09

CODE IDENT	DWG NO	REV
C	22110697	A
	SHEET PROC CONT 7	PAGE 7 OF 7

PAGE					REVISION RECORD					
5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	CA48908	CLASS A RELEASE	KMS	06/87	NS	NS

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MATERIAL
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DWN	M E SCHMIDT	06/87
CHKD	N SAMPSON	06/87
ENGR	R CAIN	06/87
MFG		
APVD	L B ULFIG	06/87

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

TITLE

LOGIC DIAGRAM
RAM MEMORY BOARD

PWA-52681115
PWB-22012832

SIZE C
FSCM NO. 34010
DWG NO. 22110698

LOC: A10
SHEET RAM 1
PAGE 1 OF 5

16 X 18 BIT MEMORY (A10-2)

ADDRESS BUS RECEIVERS

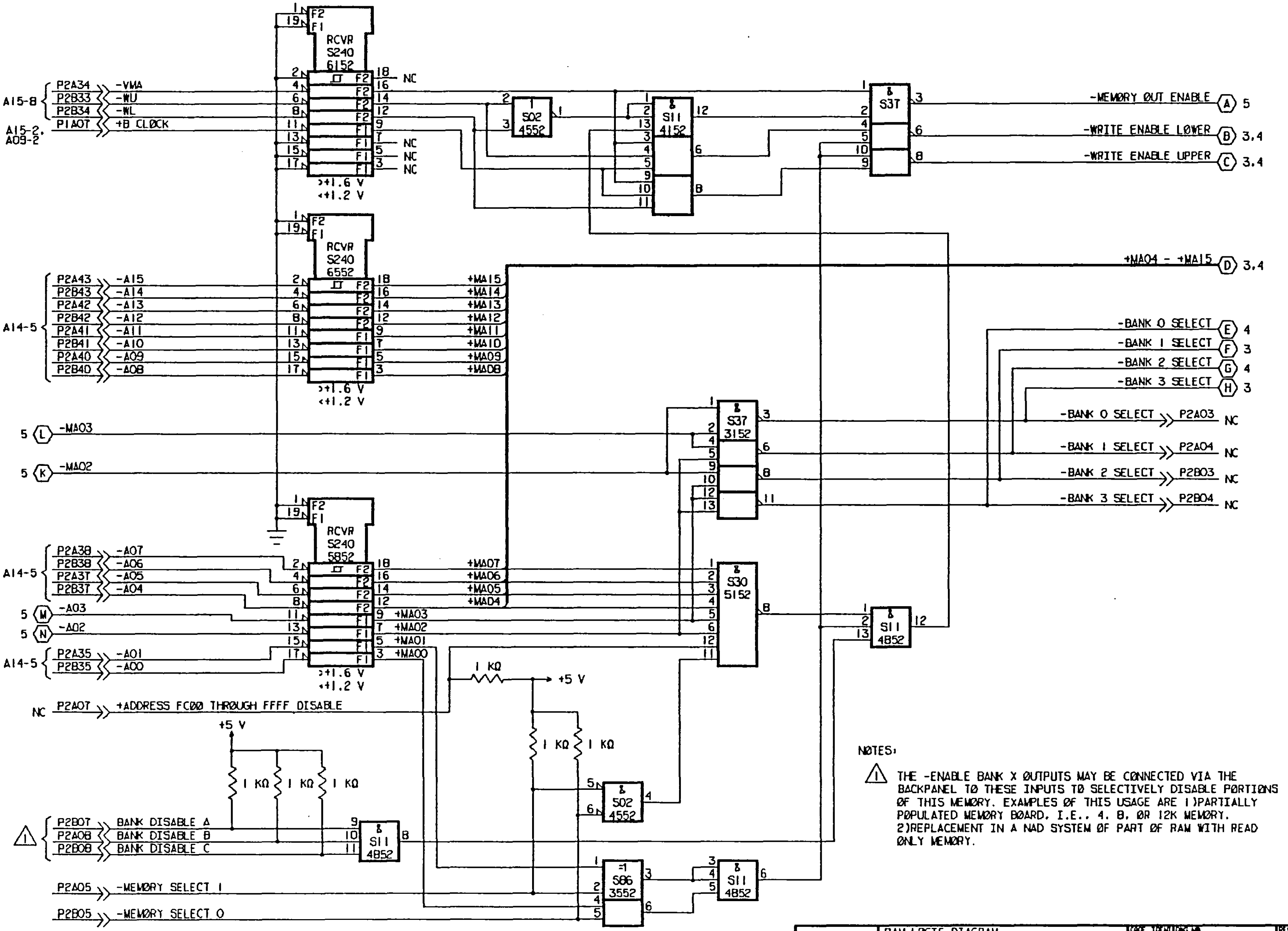
During a RAM read or write memory operation, a 16-bit address (bits A00 through A15) and associated memory control signals are sent on the address bus to the receivers. The address is then designated as memory address bits MA00 through MA15 and sent to the RAM memory banks (A10-3 and A10-4) for address selection.

The control signals VMA (valid memory address), WU (write upper), WL (write lower) originating from (A17-3) are used to enable the memory for a read or write operation.

BANK SELECTION

Bank selection is accomplished by decoding memory address bits MA02 and MA03 to select one of four memory banks (A10-3 and A10-4). The decode is performed in binary as follows:

MA03	MA02	BANK
0	0	0
0	1	1
1	0	2
1	1	3



NOTES:

⚠ THE -ENABLE BANK X OUTPUTS MAY BE CONNECTED VIA THE BACKPANEL TO THESE INPUTS TO SELECTIVELY DISABLE PORTIONS OF THIS MEMORY. EXAMPLES OF THIS USAGE ARE 1)PARTIALLY POPULATED MEMORY BOARD, I.E., 4, 8, OR 12K MEMORY. 2)REPLACEMENT IN A NAD SYSTEM OF PART OF RAM WITH READ ONLY MEMORY.

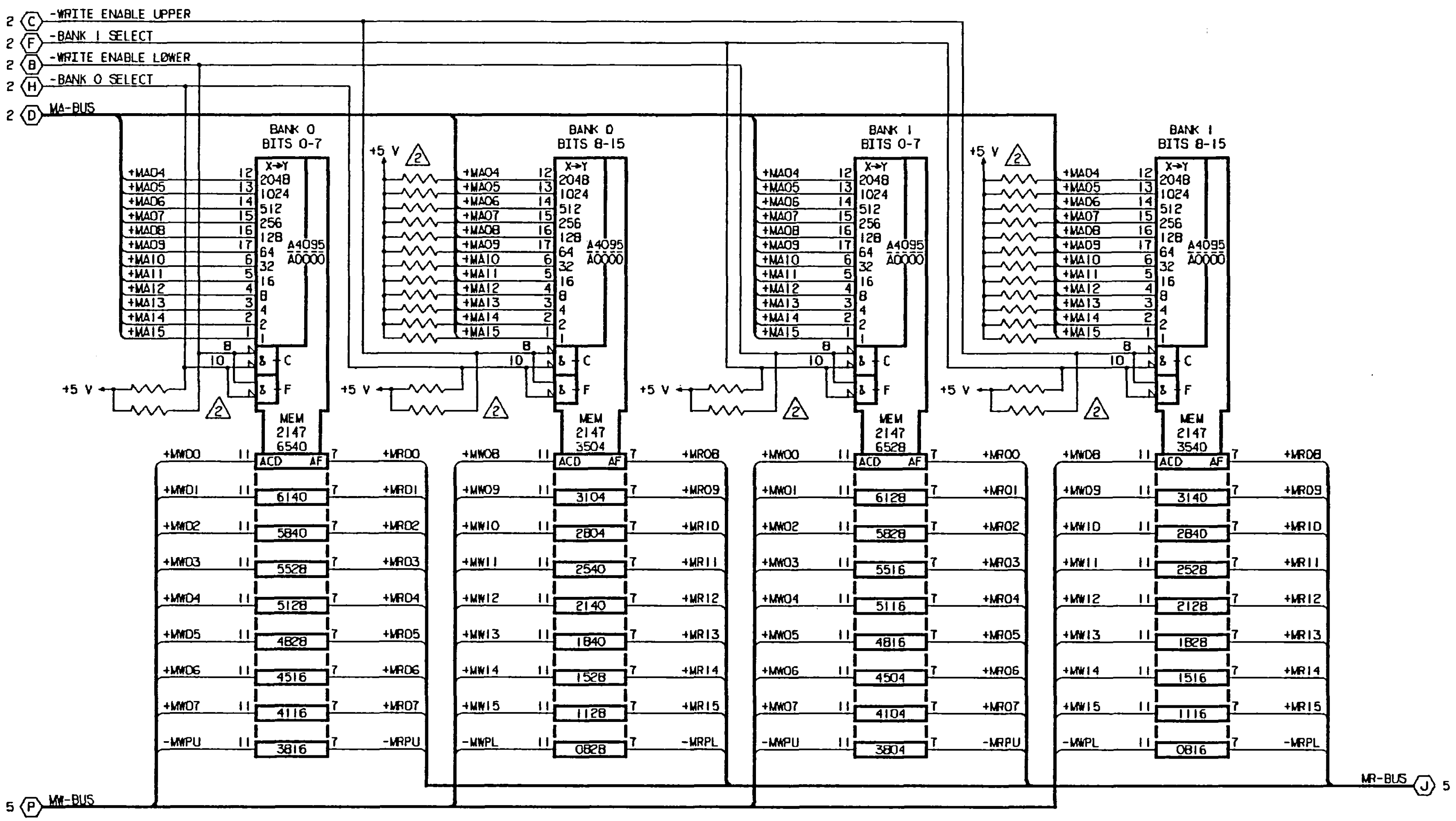
CONTROL DATA	RAM LOGIC DIAGRAM 16K X 18 BIT MEMORY	CODE IDENT	DWG NO 22110698	REV A
DEVELOPMENT DIVISION	LOC:A10	C	SHEET RAM 2	PAGE 2 OF 5

16 X 18 BIT MEMORY (A10-3, A10-4)

RAM MEMORY BANKS

The RAM memory consists of four 4K by 18-bit banks. Banks 0 and 1 are shown on diagram (A10-3) and banks 2 and 3 are shown on diagram (A10-4). Each memory bank is divided into two 9-bit segments, upper and lower. The upper banks store data bits 0 through 7 and an upper parity bit. The lower banks store data bits 8 through 15 and a lower parity bit. Bank 0 addresses are 0000 through 4095, bank 1 addresses are 4096 through 8191, bank 2 addresses are 8192 through 12 287, and bank 3 addresses are 12 288 through 16 383.

The bank select bits (A10-2) select which bank is enabled for the read or write memory operation. During a write operation, the data received from the data bus via the data receivers (A10-5) is routed to the selected memory bank for storage at a specified address. During a read operation, the data stored at a specified address of the selected memory bank is routed to the data bus via the the data drivers (A10-5).



NOTES:

2 MEMORY CHIP ADDRESS RESISTOR LOCATIONS. ALL RESISTORS ARE 1 KΩ.

MEMORY CHIP LOCATION	MEMORY CHIP PIN NUMBER 1	2	3	4	5	6	8	10	12	13	14	15	16	17
XX04	0306 2	0306 3	0306 5	0306 6	0306 7	0306 8	0210 6	0306 10	0306 9	0210 5	0210 4	0210 3	0210 2	0306 4
XX16	0316 2	0210 9	0210 10	0316 5	0316 7	0316 8	0222 4	0316 10	0316 9	0222 3	0222 2	0316 6	0316 4	0316 3
XX28	0222 6	0326 3	0326 4	0326 5	0326 6	0326 7	0326 10	0326 2	0326 9	0326 8	0222 10	0222 9	0222 8	0222 7
XX40	0336 5	0336 6	0336 7	0336 8	0336 9	0336 10	0240 9	0240 8	0240 7	0240 6	0240 5	0240 4	0240 3	0240 2

RESISTOR PACKAGE LOCATION AND PIN NUMBER

CONTROL DATA DEVELOPMENT DIVISION	RAM LOGIC DIAGRAM 16K X 18 BIT MEMORY LOC:A10	CODE IDENT C	DWG NO 22110698 SHEET RAM 3	REV A PAGE 3 OF 5

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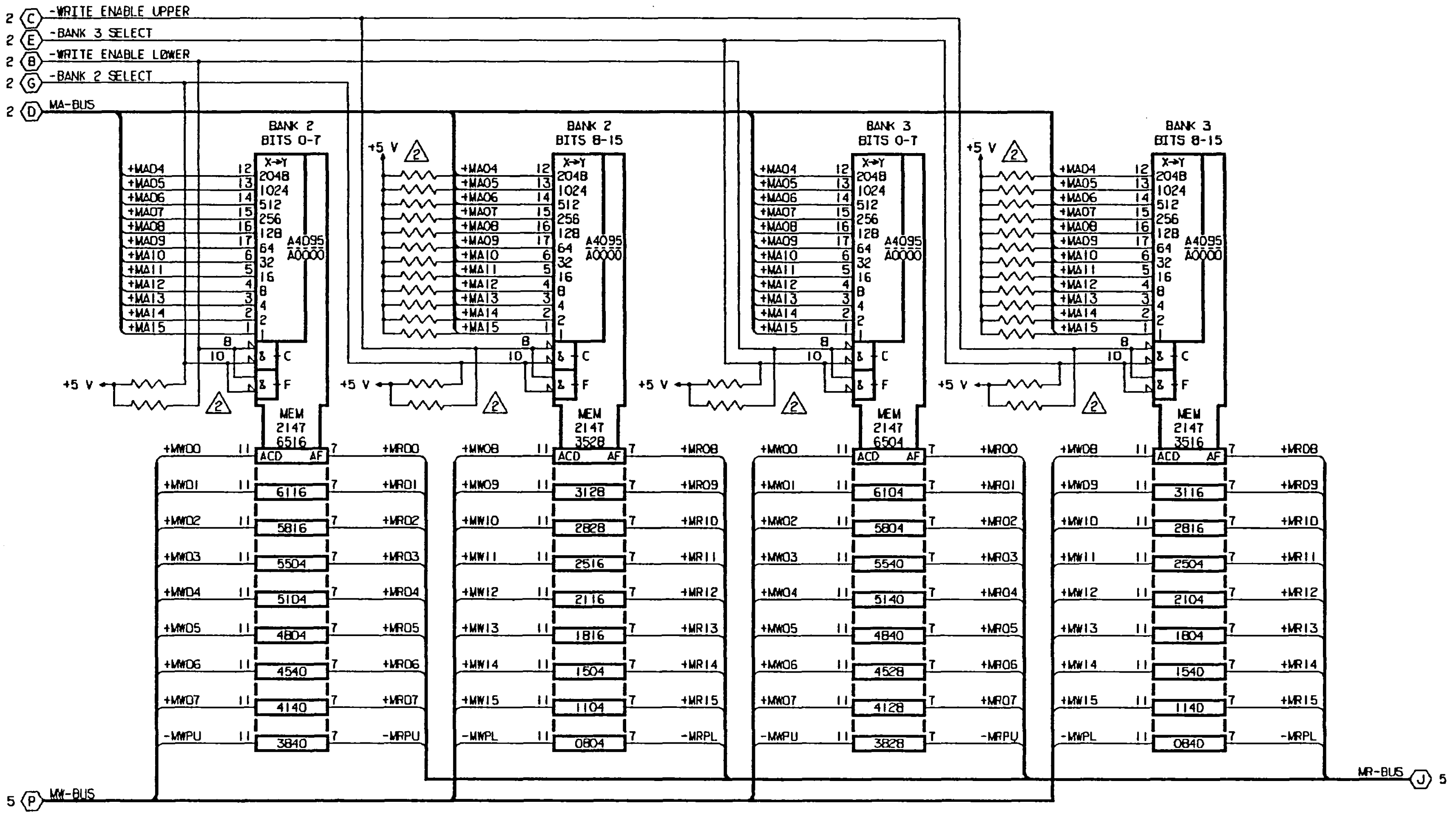


NOTES:

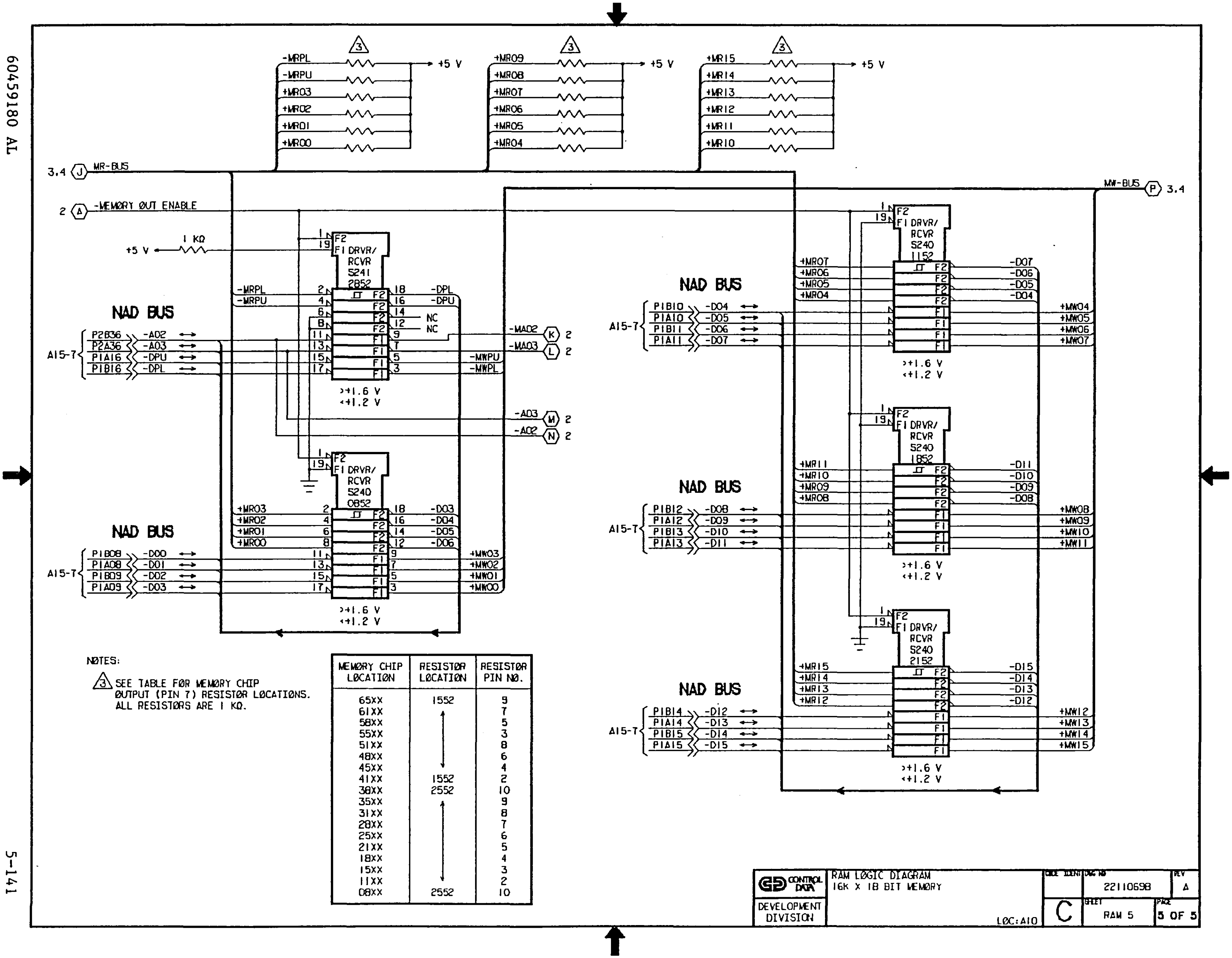
(2) SEE SHEET 3.

CONTROL DATA	RAM LOGIC DIAGRAM 16K X 18 BIT MEMORY	CODE IDENT	DWG NO 22110698	REV A
DEVELOPMENT DIVISION	LOC: A10	C	SHEET RAM 4	PAGE 4 OF 5

16 X 18 BIT MEMORY (A10-5)

DATA BUS DRIVERS/RECEIVERS

During a memory write operation, data from the data bus is routed to the addressed memory location for storage via the driver/receiver circuits. During a memory read operation, data from the addressed memory location is routed to the data bus via the driver/receiver circuits.



NOTES:

3 SEE TABLE FOR MEMORY CHIP OUTPUT (PIN 7) RESISTOR LOCATIONS. ALL RESISTORS ARE 1 KΩ.

MEMORY CHIP LOCATION	RESISTOR LOCATION	RESISTOR PIN NO.
65XX	1552	9
61XX	↕	7
58XX		5
55XX		3
51XX		8
48XX		6
45XX		4
41XX	1552	2
38XX	2552	10
35XX	↕	9
31XX		8
28XX		7
25XX		6
21XX		5
18XX		4
15XX		3
11XX		2
08XX	2552	10

CONTROL DATA
DEVELOPMENT DIVISION
RAM LOGIC DIAGRAM
16K X 18 BIT MEMORY
LOC:A10
CODE IDENT
DWG NO 22110698
REV A
C
SHEET RAM 5
PAGE 5 OF 5

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PAGE				REVISION RECORD					
4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	NZ
B	B	B	B	CA47702	INACTIVE, FOR SERVICE USE ONLY SUPERSEDED BY PWB-53590870	MES	8/12/86	NS	NS
C	C	C	C	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/26/87	NS	NS

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PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	R T HENNING	01/85
MFG	B J REILAND	01/85
APVD	R T HENNING	01/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM PROM BOARD

PWA-22118208
PWB-67045721

SIZE C
FSCM NO. 34010
DWG NO. 23102907
LOC: A13
SHEET PROM 1
PAGE 1 OF 4

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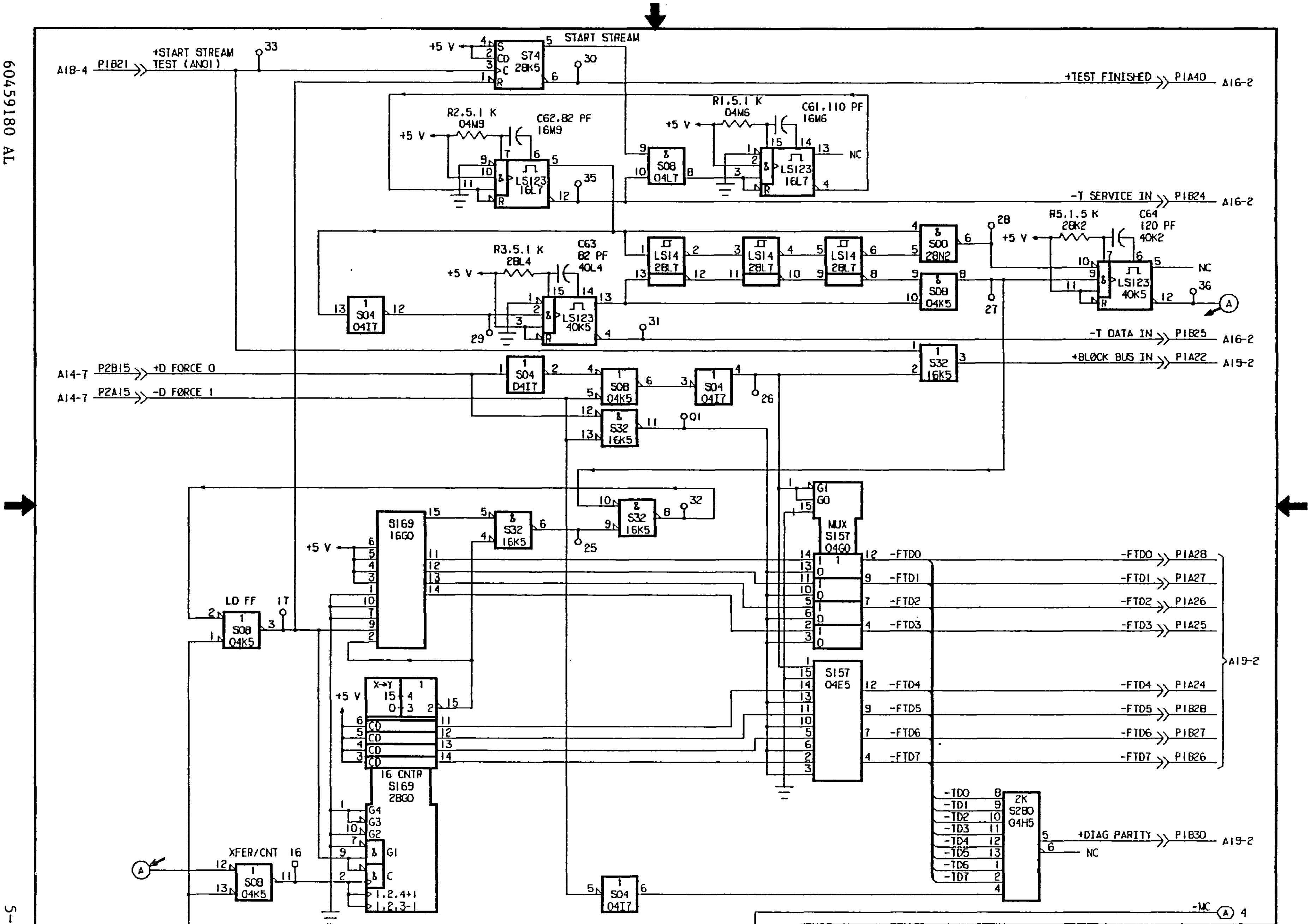


CONTROL DATA

DEVELOPMENT DIVISION

CCC PROM LOGIC DIAGRAM

LOC: A13

CODE IDENT

DWG NO 23102907

REV C

C

SHEET PROM 2

NO 2 OF 4

PROM LOGIC (A13-3)

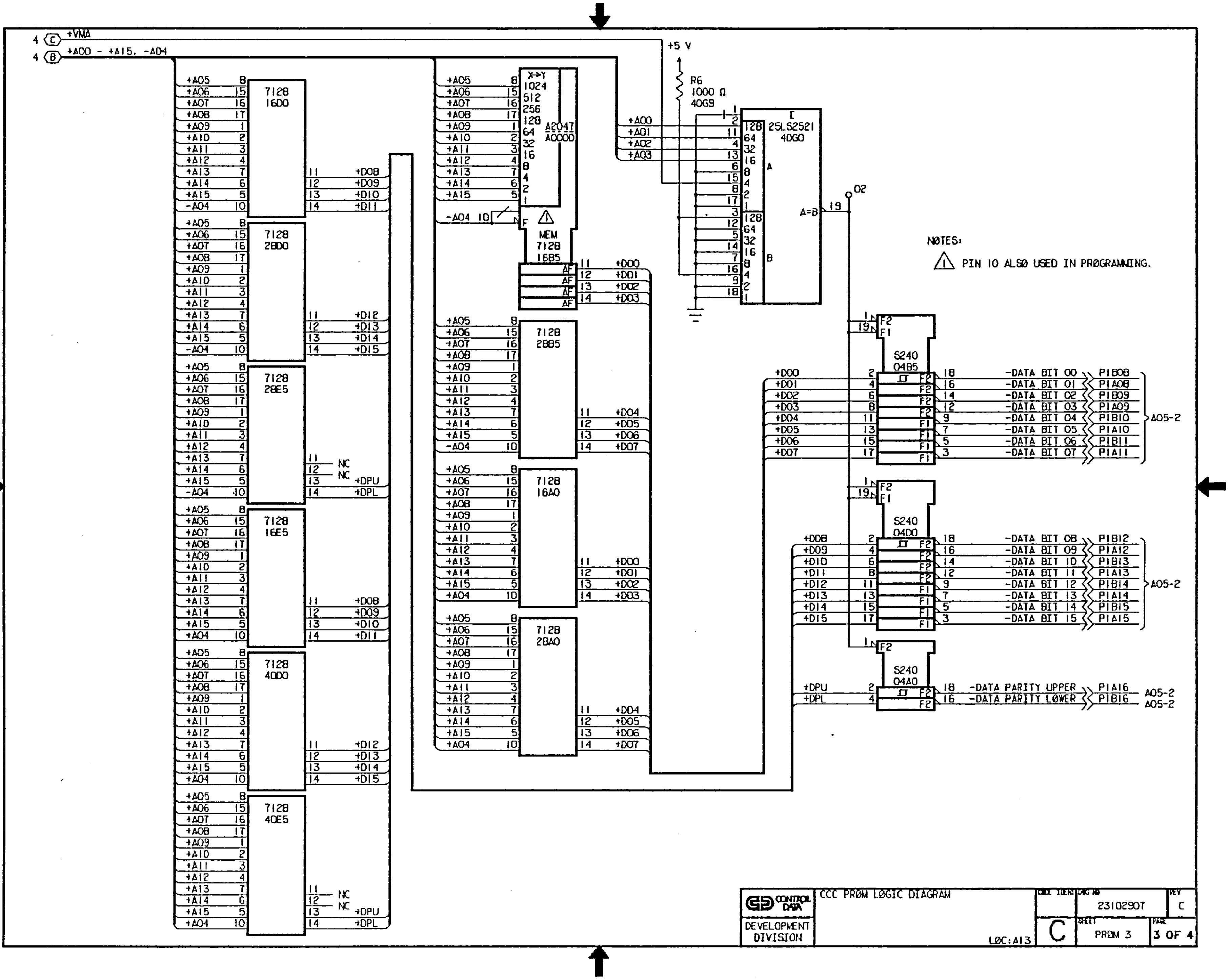
PROM

The PROM consists of ten 4-bit memory chips. Each chip has 2048 (2K) locations. The chips are arranged in two groups to provide locations for 4K 16-bit data words plus two parity bits for each word.

Address bits A05 through A15 are used to address the memory locations in the two 2K groups. Address bit +A04 selects one group and address bit -A04 selects the other group.

DATA BUS DRIVERS

Address bits A00 through A03 and a valid memory address signal (+VMA) allow an arithmetic summing network to gate PROM data bits 00 through 15 and the two parity bits through the data bus drivers to the data bus.



NOTES:

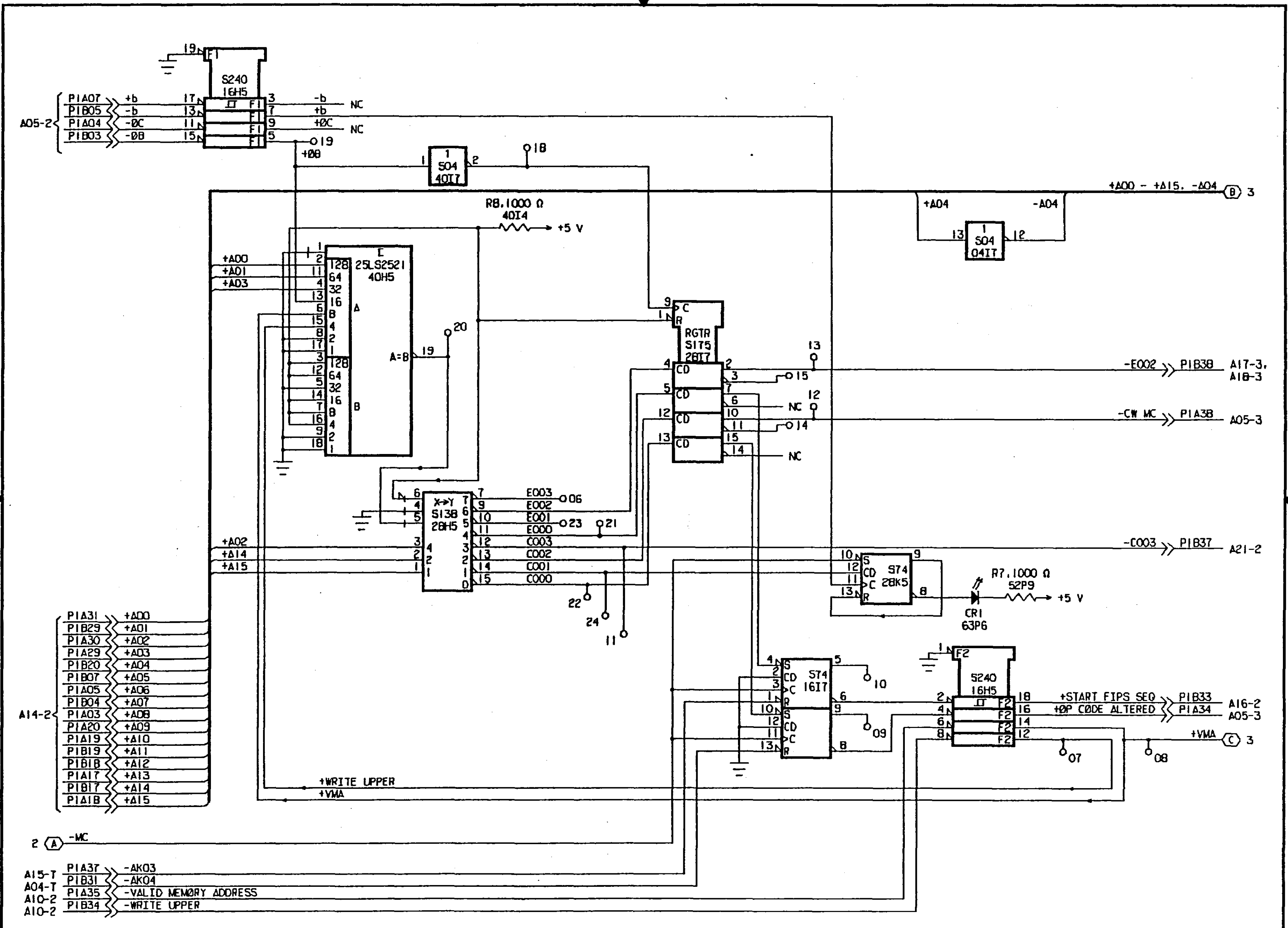
⚠ PIN 10 ALSO USED IN PROGRAMMING.

CONTROL DATA
DEVELOPMENT DIVISION

CCC PROM LOGIC DIAGRAM

LOC:A13

CODE IDENT	DWG NO	REV
C	23102907	C
	SHEET PROM 3	PAGE 3 OF 4



CONTROL DATA
DEVELOPMENT DIVISION

CCC PRØM LØGIC DIAGRAM

LØC:A13

CODE IDENT	DWG NO	REV
C	23102907	C
	SHEET PRØM 4	PAGE 4 OF 4

PAGE				REVISION RECORD					
4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	CA47702	CLASS A RELEASED REPLACES PWB-67045721	MES	8/12/86	NS	NS
B	B	B	B	CA48239	ADDED COVER. RE-INTERSHEET	MES	9/15/86	NS	NS
B	B	C	C	CA48384	CHANGED IC F169 TO S169, PAGE 2	MES	12/18/86	NS	NS

NOTES:

1. THIS DOCUMENT IS CONTAINED ON MAGNETIC TAPE. MAGNETIC TAPE IS STORED IN THE EDP GROUP OF ENGINEERING SERVICES SECTION,CDED DIVISION.
2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.
4. THE CHIP IDENTIFIERS ON PWA-53590869 WERE CHANGED TO 'F' TYPE CHIPS. UNLESS OTHERWISE NOTED.
   EXAMPLE 'S74' ON PWA-22183281 IS NOW 'F74' ON PWA-53590869.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	E F ARLANDSON	12/85
CHKD	N ZAK	12/85
ENGR	R T HENNING	08/86
MFG	B J REILAND	08/86
APVD	R T HENNING	08/86

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

TITLE

LOGIC DIAGRAM
PROM BOARD

PWA-53590727
PWB-53590870

SIZE C
FSCM NO. 34010
DWG NO. 53590871
LOC: A13
SHEET PROM 1-F
PAGE 1 OF 4

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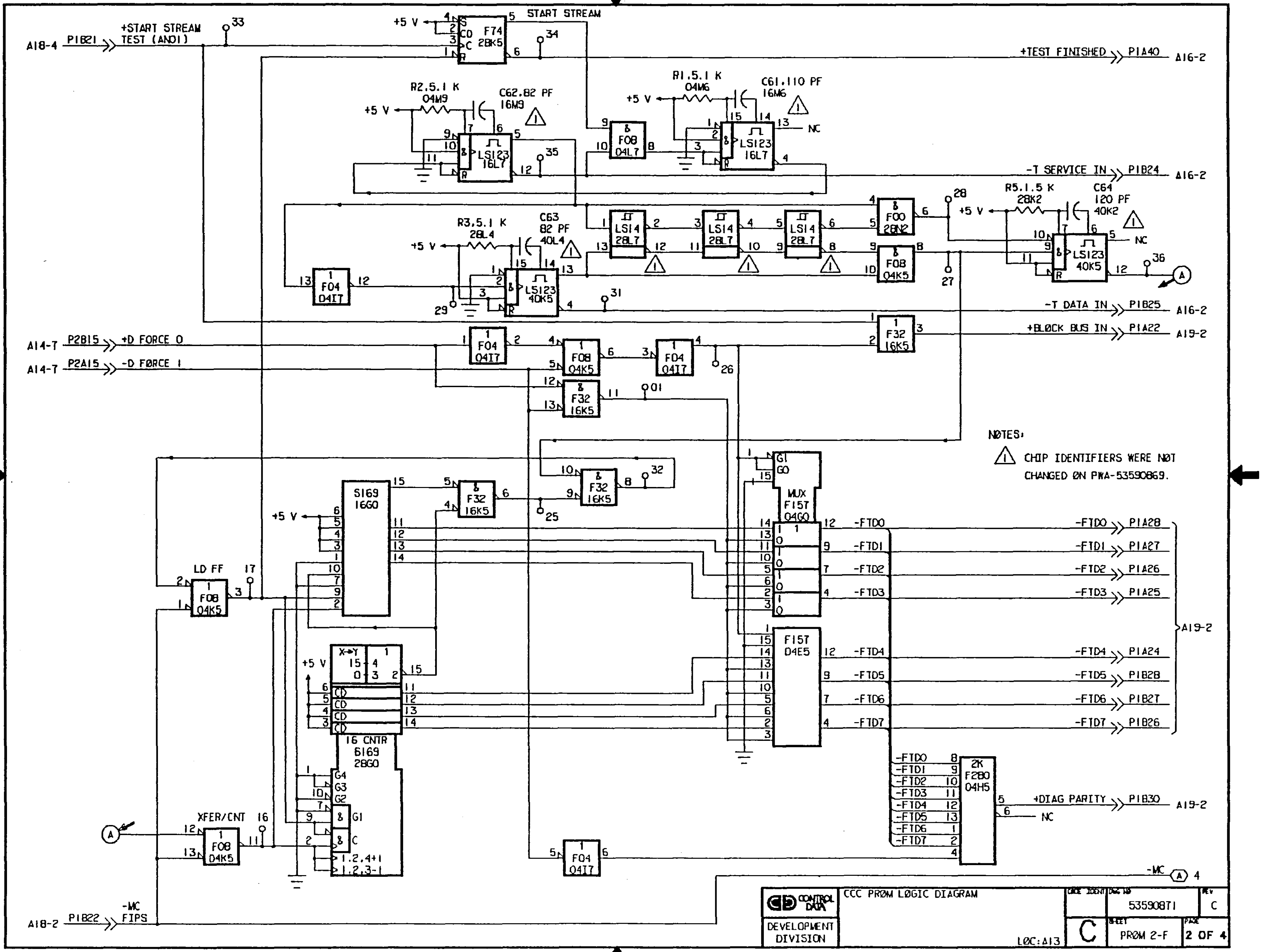

A18-4
P1B21
+START STREAM TEST (AN01)
33
+5 V
F74 28K5
START STREAM
34
+TEST FINISHED
P1A40
A16-2
R2,5.1 K 04M9
C62,82 PF 16M9
LS123 16L7
35
F08 04L7
R1,5.1 K 04M6
C61,110 PF 16M6
LS123 16L7
NC
-T SERVICE IN
P1B24
A16-2
LS14 28L7
F00 28N2
28
R5,1.5 K 28K2
C64 120 PF 40K2
LS123 40K5
NC
36
A
R3,5.1 K 28L4
C63 82 PF 40L4
LS123 40K5
F08 04K5
27
F04 04I7
29
31
-T DATA IN
P1B25
A16-2
F32 16K5
+BLOCK BUS IN
P1A22
A19-2
A14-7
P2B15
+D FORCE 0
A14-7
P2A15
-D FORCE 1
F04 04I7
F08 04K5
F04 04I7
26
F32 16K5
01
NOTES:
CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590869.
F32 16K5
32
S169 16G0
F32 16K5
25
MUX F157 04G0
G1
G0
-FTD0
P1A28
-FTD1
P1A27
-FTD2
P1A26
-FTD3
P1A25
A19-2
LD FF
17
F08 04K5
F157 D4E5
-FTD4
P1A24
-FTD5
P1B28
-FTD6
P1B27
-FTD7
P1B26
X→Y
CD
16 CNTR
S169 28G0
G4
G3
G2
G1
C
1,2,4+1
1,2,3-1
XFER/CNT
16
F08 D4K5
2K F280 04H5
+DIAG PARITY
P1B30
A19-2
NC
F04 04I7
-MC
A18-2
P1B22
-MC FIPS
CONTROL DATA
DEVELOPMENT DIVISION
CCC PROM LOGIC DIAGRAM
LOC:A13
53590871
C
C
PROM 2-F
2 OF 4

PROM LOGIC (A13-3)

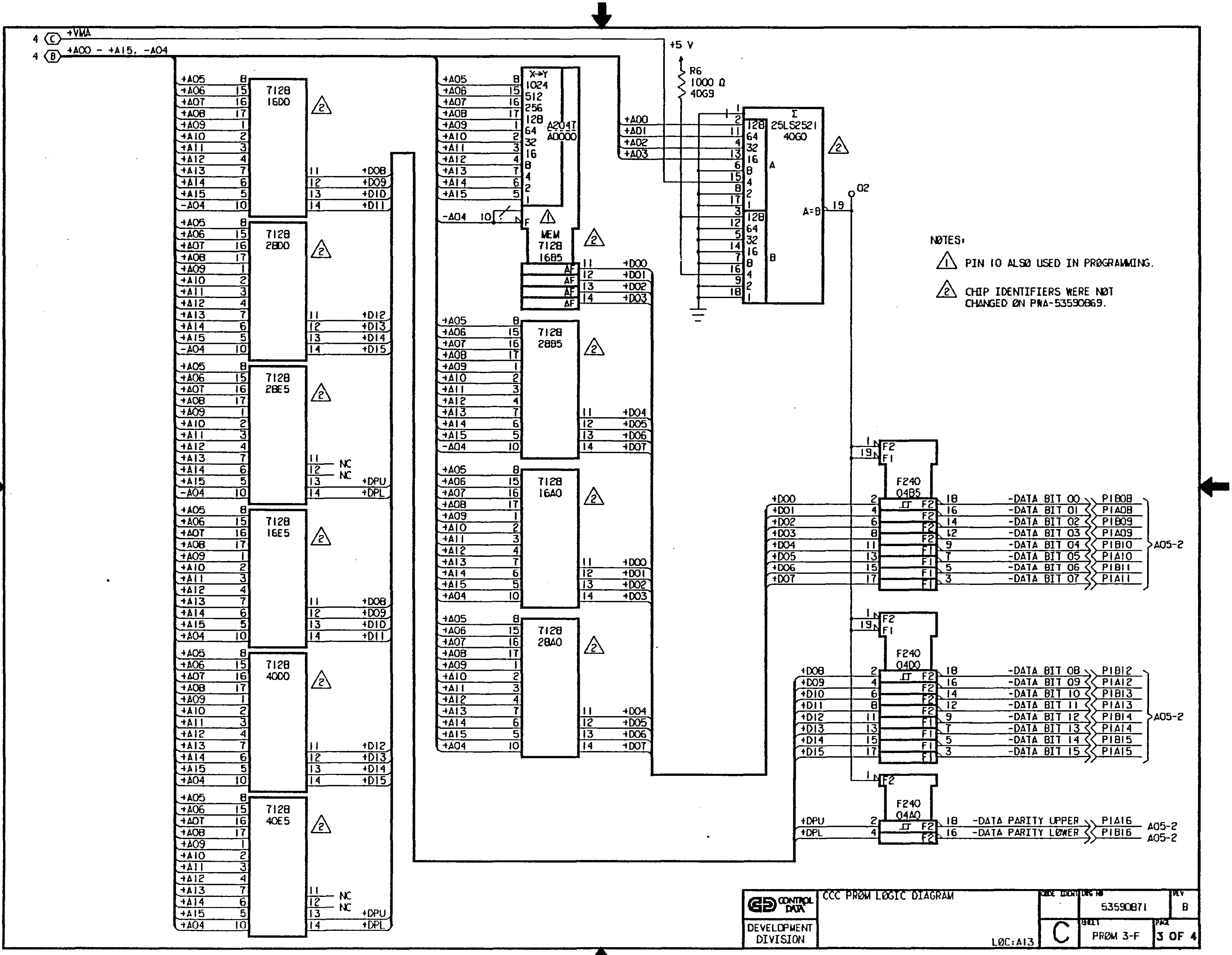
PROM

The PROM consists of ten 4-bit memory chips. Each chip has 2048 (2K) locations. The chips are arranged in two groups to provide locations for 4K 16-bit data words plus two parity bits for each word.

Address bits A05 through A15 are used to address the memory locations in the two 2K groups. Address bit +A04 selects one group and address bit -A04 selects the other group.

DATA BUS DRIVERS

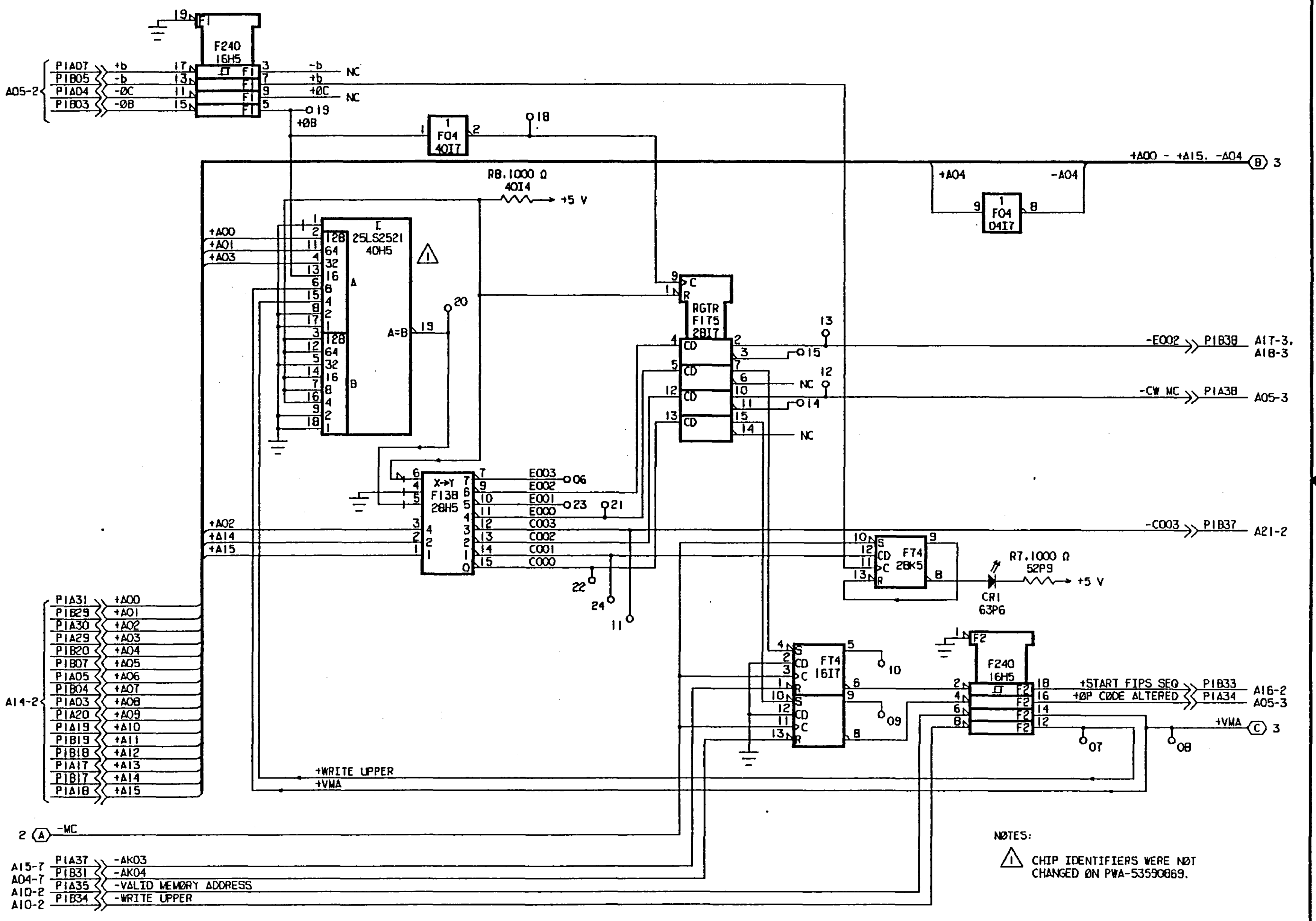
Address bits A00 through A03 and a valid memory address signal (+VMA) allow an arithmetic summing network to gate PROM data bits 00 through 15 and the two parity bits through the data bus drivers to the data bus.



NOTES:

1. PIN 10 ALSO USED IN PROGRAMMING.
2. CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590869.

CONTROL DATA DEVELOPMENT DIVISION	CCC PROM LOGIC DIAGRAM LOC:A13	C	DWG NO 53590871 SHEET PROM 3-F	REV B PAGE 3 OF 4



NOTES:

1. CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590869.

CONTROL DATA DEVELOPMENT DIVISION	CCC PROM LOGIC DIAGRAM LOC:A13	C	53590871 SHEET PROM 4-F	REV B PAGE 4 OF 4

PAGE								REVISION RECORD					
8	7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A	A		CLASS A RELEASED	MES	12/84	NZ	RH
B	B	B	B	B	B	B	B	CA46040	SEE C.O.	MES	04/85	NZ	RH
C	B	C	B	C	C	C	C	CA47357	SEE C.O.	MES	10/85	NZ	NZ
D	D	D	D	D	D	D	D	CA48239	INACTIVE. FOR SERVICE USE ONLY SUPERSEDED BY PWB-22179691	MES	1/23/87	NS	NS

NOTES:

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	12/84
CHKD	N ZAK	12/84
ENGR	L.B. ULFIG	02/85
MFG	B.J. REILAND	02/85
APVD	L.B. ULFIG	02/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

TITLE
LOGIC DIAGRAM
TRANSFER LOGIC

PWA-53595831 PWB-23106107

SIZE C FSCM NO. 34010 DWG NO. 23102913

LOC: A14 SHEET XFER 1 R PAGE 1 OF 8

TRANSFER LOGIC (A14-2)

GENERAL

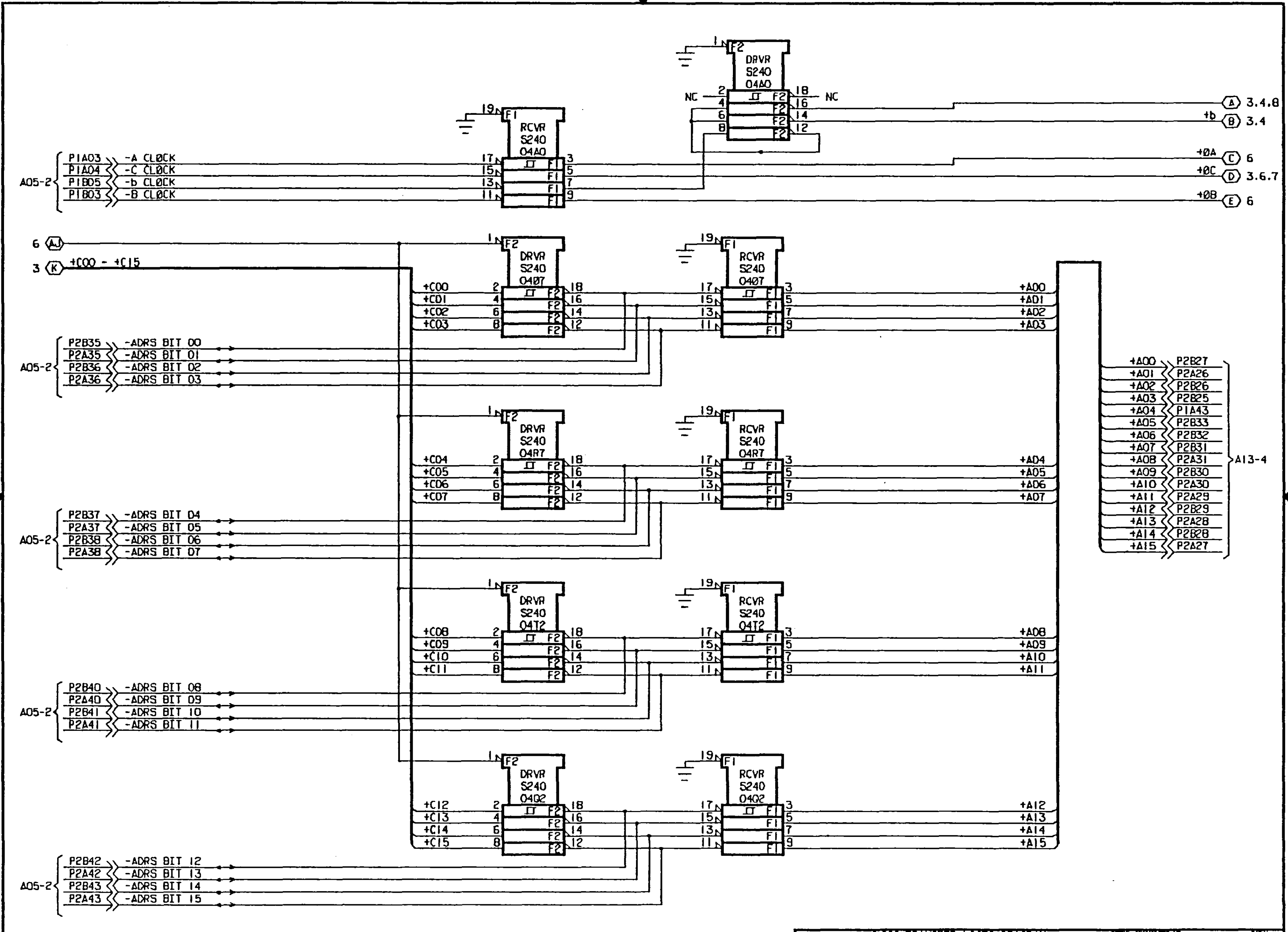
The transfer logic provides the necessary circuits to transfer data from the CYBER channel interface, through memory to the FIPS device, and vice versa, without requiring use of either interface UDI. The processor sets up the transfer operation by initiating a FIPS device interface control sequence to load the transfer registers. The processor then places the CYBER channel interface and/or the FIPS device interface in transfer mode. During the transfer, data is written into a circular buffer by one interface and read from that buffer by the other interface. When an interface is in transfer mode, the interface memory slot time is used by the transfer logic and the interface UDI is unable to reference memory. The UDI regains its memory slot time when the transfer is completed or when a Master Clear signal is received.

ADDRESS BUS RECEIVERS

During a programmable read only memory (PROM) operation, the 16-bit address (bits 00 through 15) is sent from the address bus to the receivers on the bidirectional circuit pins. The address is then sent from the receivers to the PROM (A13-4).

ADDRESS BUS DRIVERS

During a DMA write or read operation, the address (bits C00 through C15) from the CCC address register/counter or CYBER address register/counter (A14-5) is sent from the drivers to the address bus on the same bidirectional circuit pins used by the address bus receivers.



CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LØGIC DIAGRAM
ADDRESS

LØC:A14

CODE IDENT

DWG NO 23102913

REV D

C

SHEET XFER 2-R

PAGE 2 OF 8

TRANSFER LOGIC (A14-3)

ADDRESS REGISTER

A 16-bit address (bits AD00 through AD15) is loaded onto the address bus by the FIPS interface UDI (A15) and sent to the address register of the transfer logic before a data transfer starts. The address register routes the address (bits B00 through B15) to the FIPS address counter and also to the CYBER address counter.

FIPS ADDRESS COUNTER

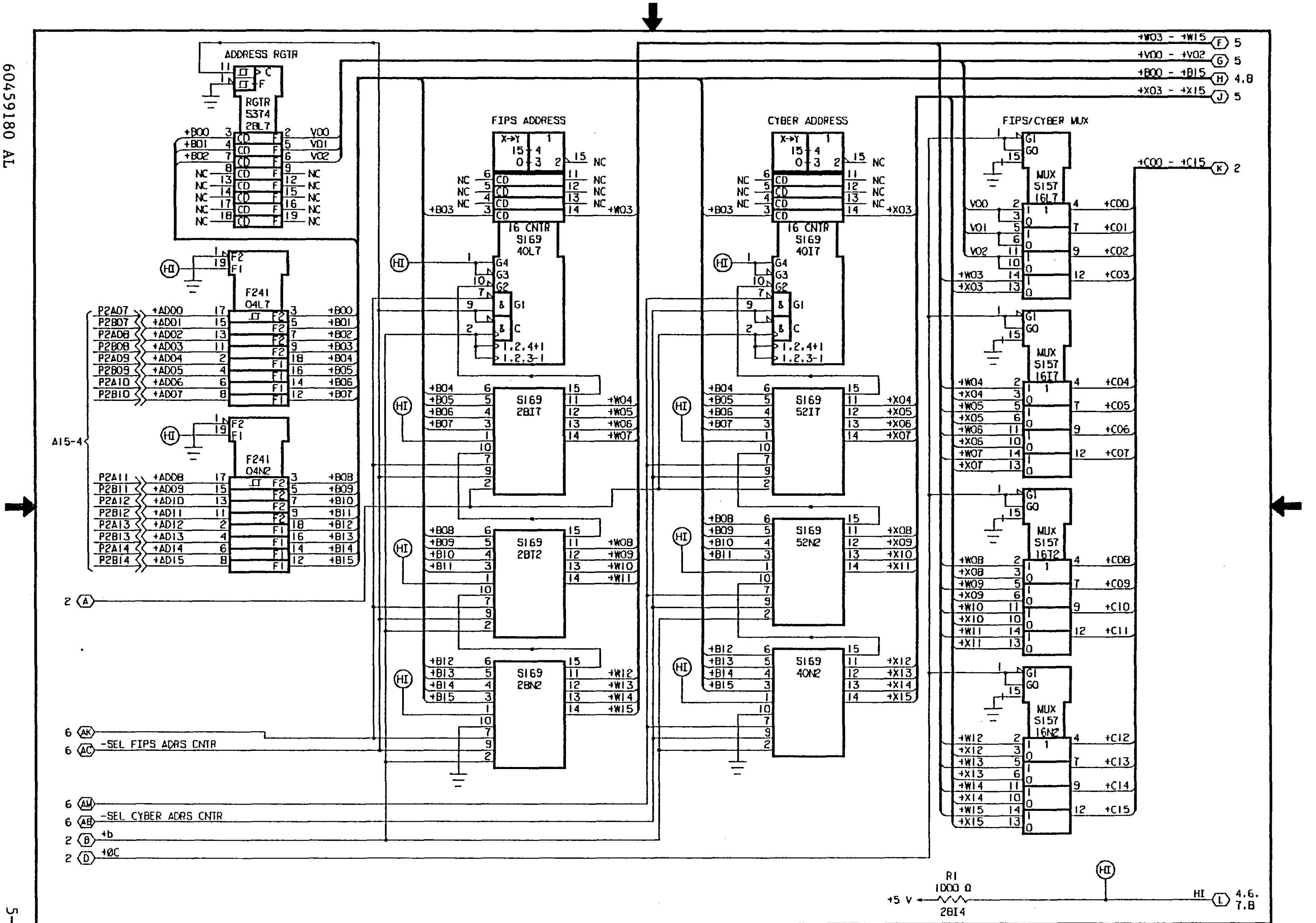
The FIPS address counter provides addresses for data transfers during the memory access time (slot time) of the FIPS interface. The FIPS interface UDI (A15) is disabled at this time. Bits 00, 01, and 02 are held in the address register and do not change during a data transfer. Bits 03 through 15 are held in the FIPS address counter. The counter increments the address each time the FIPS interface reads a word from memory (A10) or writes a word into memory. The counter has a range from 0 to 511 and wraps around to provide a 512-location circular buffer in memory. Bits 00, 01, and 02 form the upper three bits of the address used in the circular buffer.

CYBER ADDRESS COUNTER

The CYBER address counter provides the addresses for data transfers during the memory slot time of the CYBER interface. The address register is the same as that used for the FIPS address counter. The CYBER address counter increments the address each time the CYBER interface reads or writes a memory word. Operation of this counter is identical to that described for the FIPS address counter.

FIPS/CYBER MUTIPLEXER

The OC clock determines the memory slot time for the CYBER interface and gates the CYBER address bits (V00 through V02 and X03 through X15) through the multiplexer. When the OC clock is at a logic 0 level (OC clock not present), the FIPS address bits (V00 through V02 and W03 through W15) are gated through the multiplexer. The multiplexer output bits (C00 through C15) are sent to the address bus drivers (A14-2).



CONTROL DATA
DEVELOPMENT DIVISION

CCC TRANSFER LOGIC DIAGRAM
A/D BUS
ADDRESS REGISTERS

LOC:A14

CODE IDENT	DWG NO	REV
	23102913	D
C	SHEET XFER 3-R	PAGE 3 OF 8

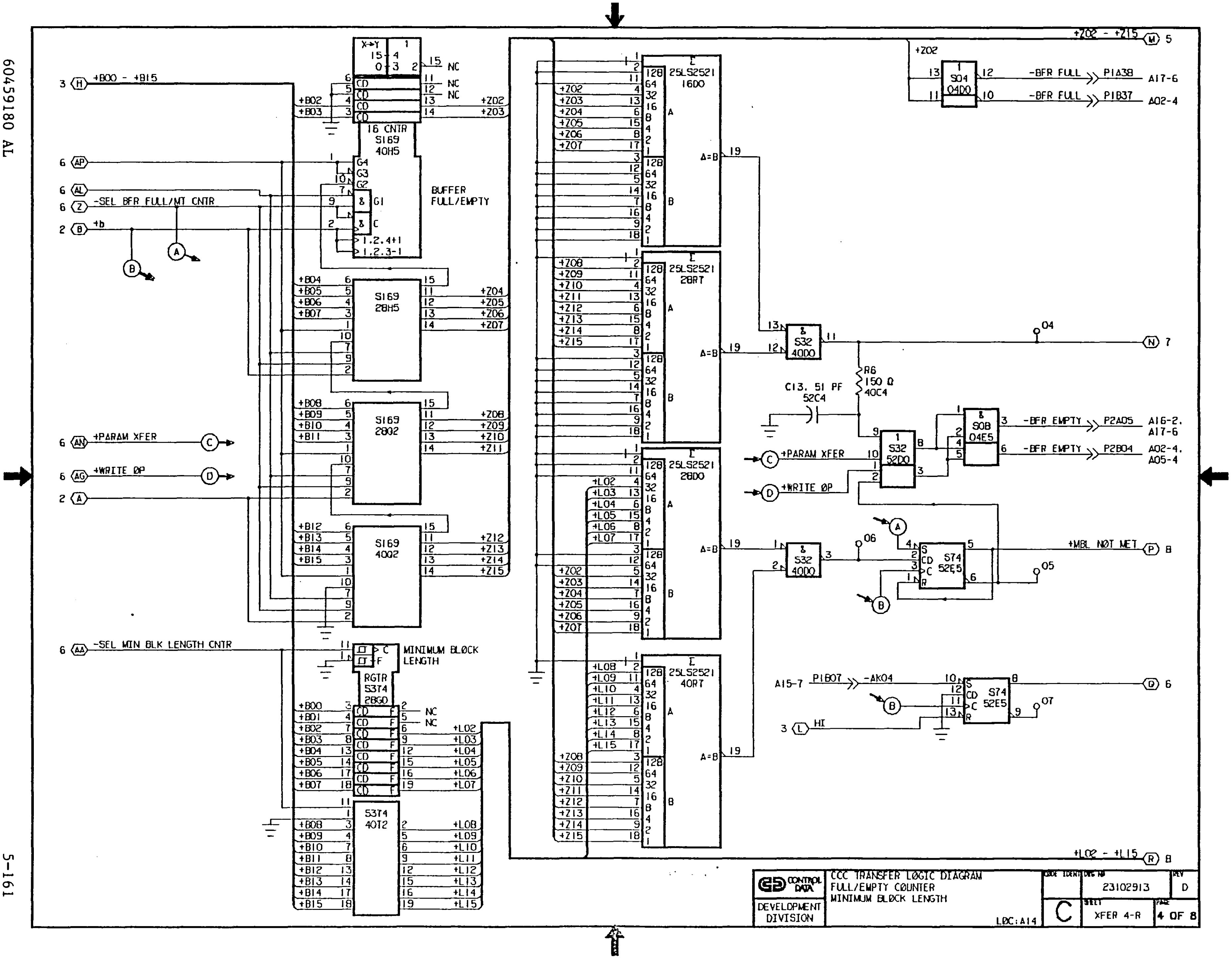
TRANSFER LOGIC (A14-4)

BUFFER FULL/EMPTY COUNTER

This is a 14-bit counter that increments when a data word is written into the 8K-location circular buffer in memory (A10). It decrements when a data word is read from the buffer. The output of the counter is decoded to provide either a Buffer Full (8192_{10} or 2000_{16} count) or Buffer Empty (0 count) signal to the CYBER interface and FIPS interface data control circuits. Data cannot be written into memory during a buffer full condition or read from memory during a buffer empty condition. This counter is loaded by the processor via the FIPS device interface.

MINIMUM BLOCK LENGTH (MBL) REGISTER

This is a 14-bit register that contains the value of the minimum number of words required in a block of data. The output of the MBL register is compared to the output of the buffer full/empty counter during a read operation. A buffer empty signal is sent to the CYBER interface (A02-4) until the buffer full/empty counter reaches a value equal to that set in the MBL counter. This prohibits data blocks shorter than the required minimum block length from being transferred to the CYBER interface. The contents of the MBL register are not used during a write operation. This register is loaded by the processor via the FIPS device interface.



CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LØGIC DIAGRAM
FULL/EMPTY CØUNTER
MINIMUM BLØCK LENGTH

LØC:A14

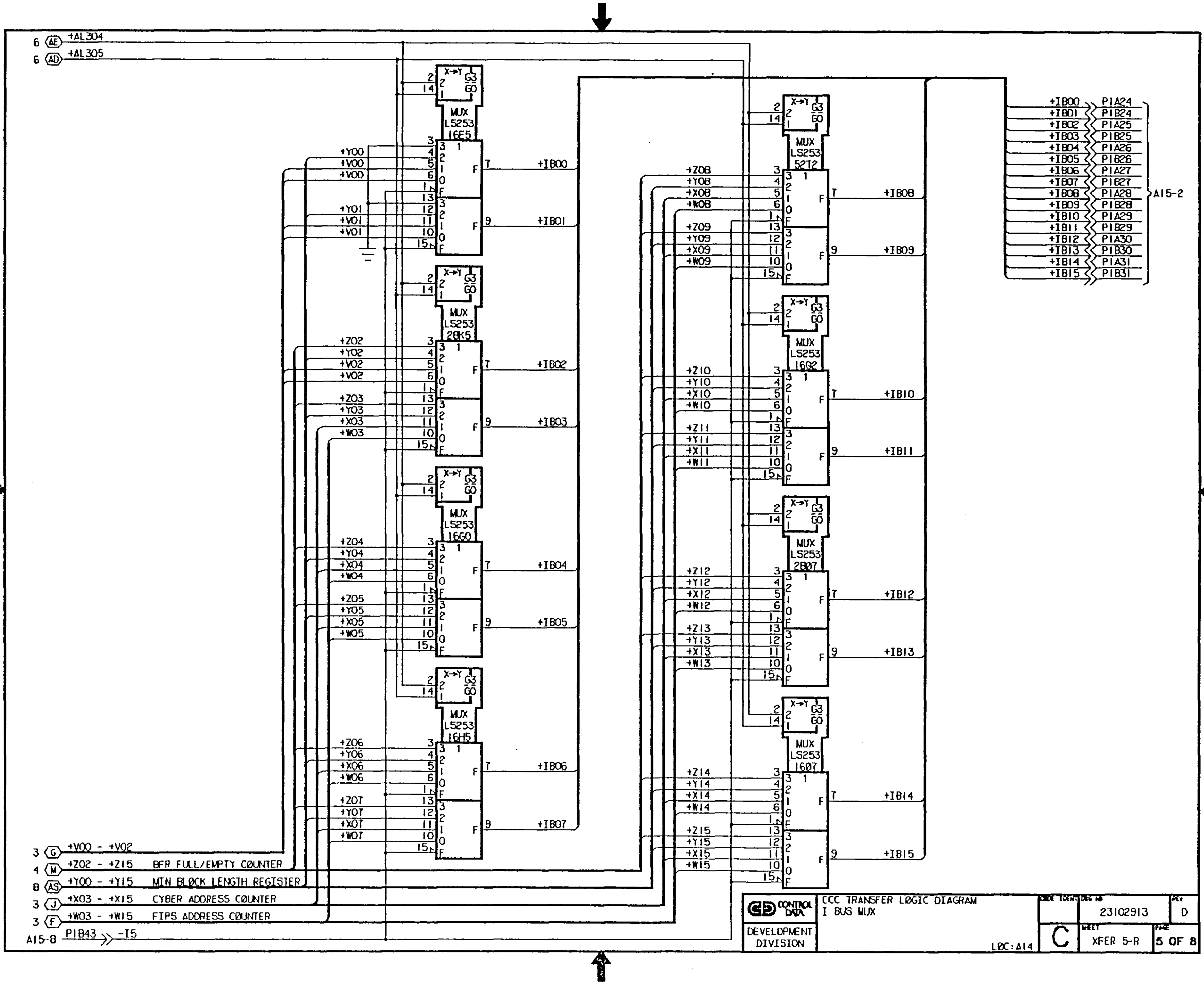
CODE IDENT	DWG NO	REV
C	23102913	D
	SHEET XFER 4-R	PAGE 4 OF 8

TRANSFER LOGIC (A14-5)

I BUS MUX

Addressable latch bits AL304 and AL305 are decoded to provide enables to the multiplexers. The following information is gated to the I bus for the various combinations of the enable bits.

AL304	AL305	I Bus Information
0	0	FIPS address (bits W03 through W15 and V00 through V02)
0	1	CYBER address (bits W03 through W15 and V00 through V02)
1	0	Minimum block length (bits Y00 through Y15)
1	1	Buffer full/empty count (bits Z02 through Z15, also note that Mux bits IB00 and IB01 become zeros because of the grounded inputs at U34 pins 3 and 13)



CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LOGIC DIAGRAM
I BUS MUX

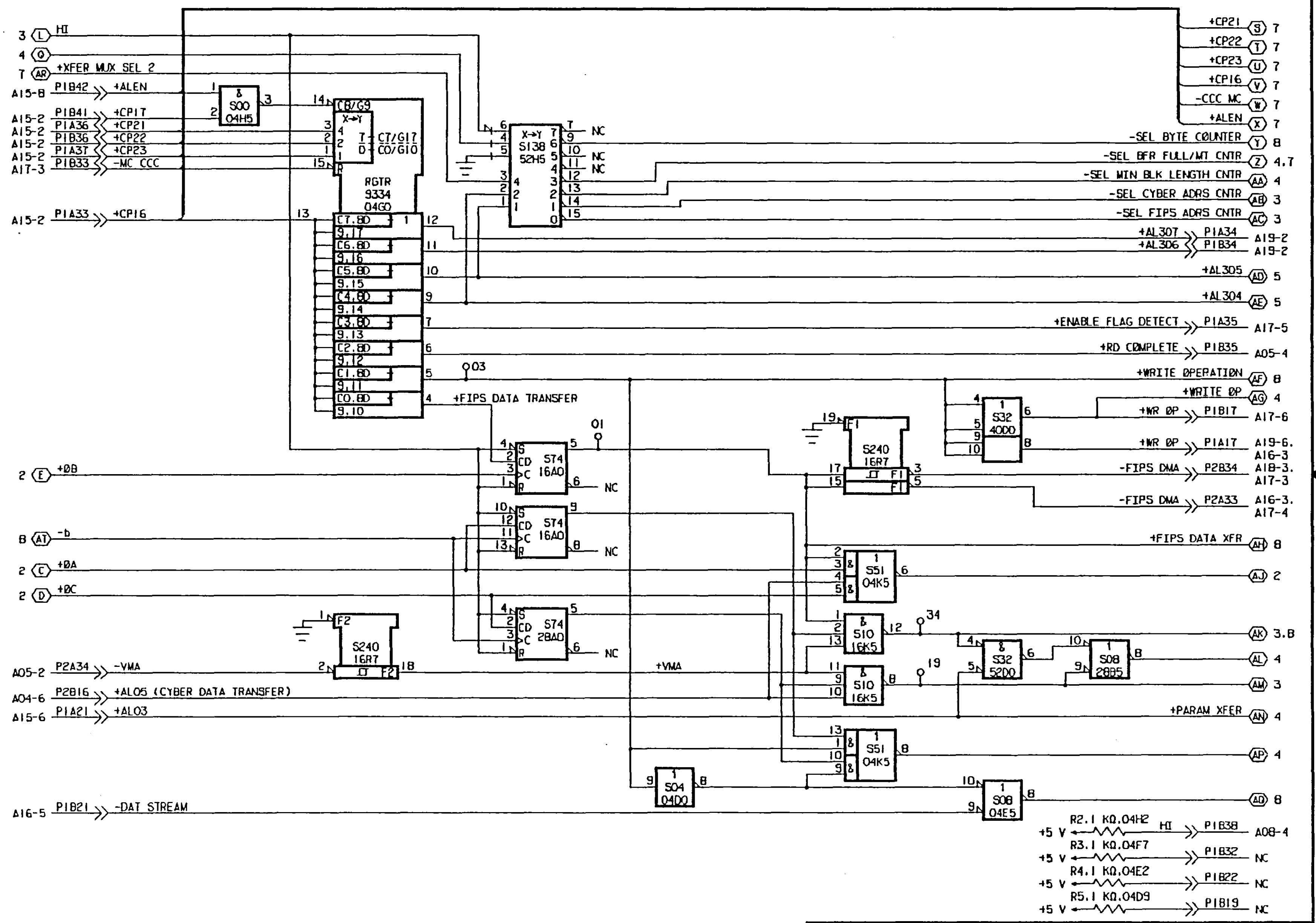
LOC:A14

CODE IDENT	DWG NO	REV
	23102913	D
C	SHEET XFER 5-R	PAGE 5 OF 8

TRANSFER LOGIC (A14-6)

ADDRESSABLE LATCH REGISTER

The outputs of the addressable latch register are selected by microcode bits CP17, CP21, CP22, and CP23 from the FIPS interface UDI (A15-2). Register outputs AL304 and AL305, and AL306 and AL307 are used to gate information through the I bus multiplexers (A14-5 and A19-2) to the I bus. The Write Operation output signal of the register functions as a direction latch that is used to indicate either a read or write operation. When cleared, a read operation is performed and data flow is from the FIPS device interface to the CYBER channel interface. When set, a write operation is performed and data flow is from the CYBER channel interface to the FIPS device interface.



CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LOGIC DIAGRAM
ADDRESSABLE LATCH

LOC:A14

CODE IDENT

DWG NO 23102913

REV D

C

SHEET XFER 6-R

PAGE 6 OF 8

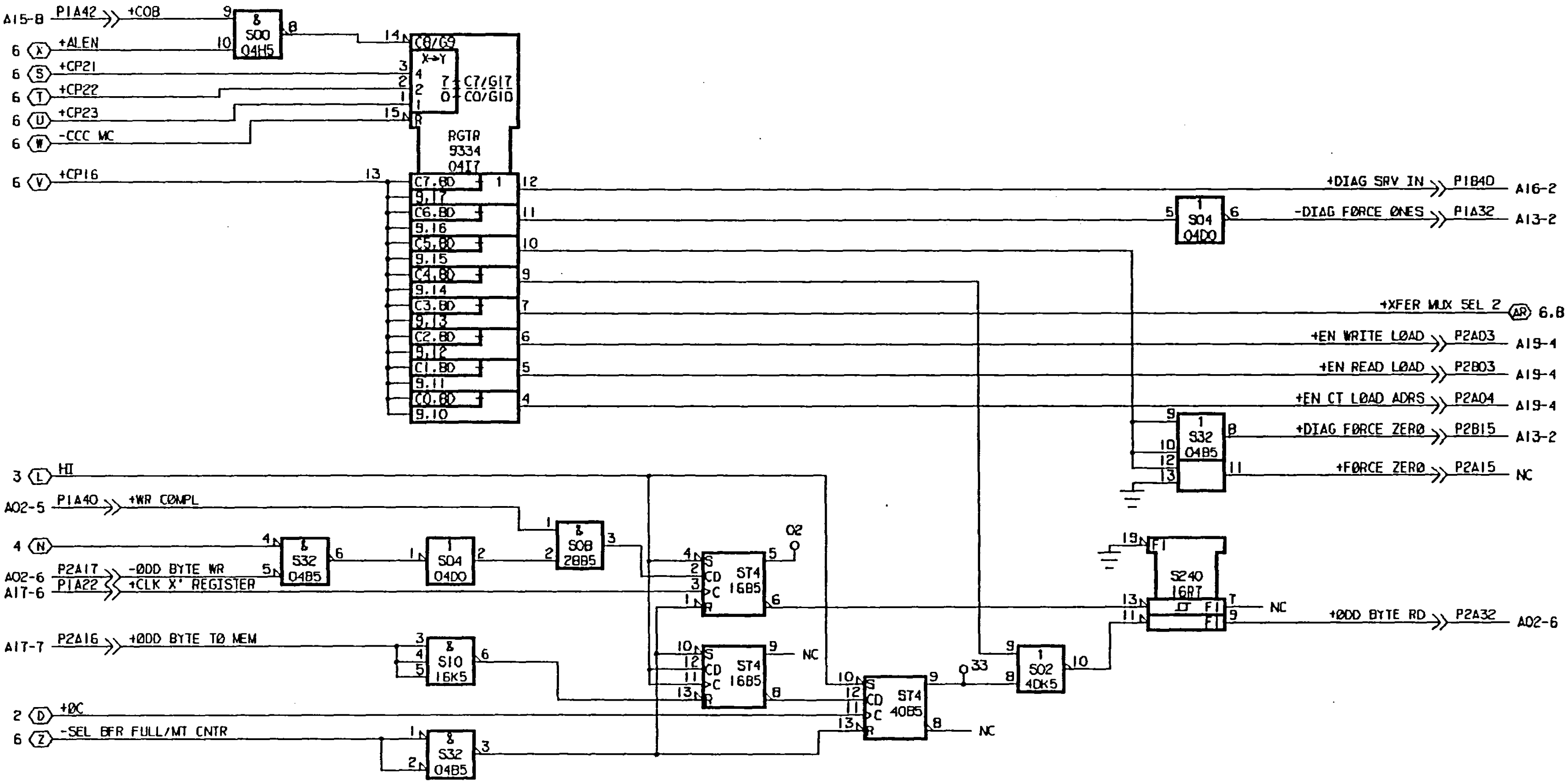
TRANSFER LOGIC (A14-7)

ADDRESSABLE LATCH REGISTER

The outputs of the addressable latch register are selected by microcode bits CP21, CP22, and CP23 from the FIPS interface UDI (A15-2).

Register outputs are used to control diagnostic functions and to enable loading code tables.

The Transfer Mux Select 2 signal is used to enable the byte counter (A14-8) output into the I bus multiplexer (A14-5).



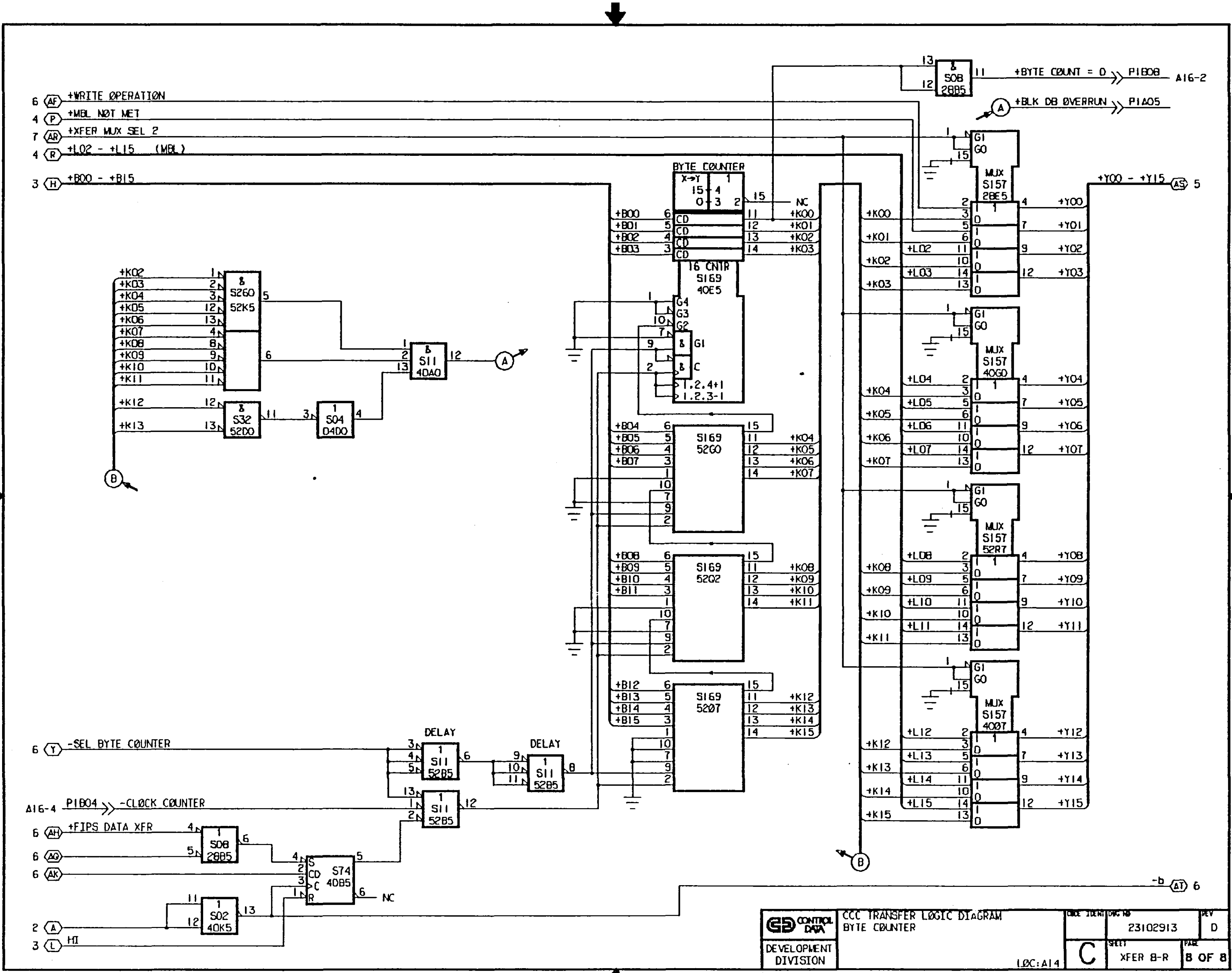
CONTROL DATA	CCC TRANSFER LOGIC DIAGRAM ADDRESSABLE LATCH	CODE IDENT	DWG NO 23102913	REV D
DEVELOPMENT DIVISION	LOC:A14	C	SHEET XFER 7-R	PAGE 7 OF 8

TRANSFER LOGIC (A14-8)

BYTE COUNTER

The byte counter is a 16-bit counter that may be used to terminate a FIPS data transfer without waiting for the FIPS device to send a Status-In signal (A16-2). The counter is loaded with one less than the number of bytes that are to be transferred. During a write operation, the count is decremented by one count each time a byte is accepted by the FIPS device. During a read operation, the count is decremented by one count each time a byte is received from the FIPS device and written into coupler memory (A10).

The byte counter output is sent to a multiplexer. The multiplexer gates either the byte counter bits or the MBL counter (A14-4) bits to the I bus multiplexer (A14-5). The Byte Count = 0 signal is sent to the control flag register of the stream logic (A16-2).



CCC TRANSFER LOGIC DIAGRAM
BYTE COUNTER

CONTROL DATA
DEVELOPMENT DIVISION

LOC:A14

CODE IDENT
C

DWG NO
23102913

REV
D

SHEET
XFER 8-R

PAGE
8 OF 8

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PAGE								REVISION RECORD					
8	7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A	A		CLASS A RELEASED	EFA	05/86	NZ	RTH
B	B	B	B	B	B	B	B	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/22/87	NS	NS
B	B	B	B	B	B	C	C	CA48647	SEE NOTE 5	MES	2/13/87	NS	NS

NOTES:

1. THIS DOCUMENT IS CONTAINED ON MAGNETIC TAPE. MAGNETIC TAPE IS STORED IN THE EDP GROUP OF ENGINEERING SERVICES SECTION,CDED DIVISION.
2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.
4. THE CHIP IDENTIFIERS ON PWA-22179698 WERE CHANGED TO 'F' TYPE CHIPS, UNLESS OTHERWISE NOTED. EXAMPLE 'S74' ON PWA-53595831 IS NOW 'F74' ON PWA-22179698.
5. THE 'F240' CHIPS AT LOCATIONS 04Q7, 04R7, 04T2, 04Q2 ON PAGE 2 WERE CHANGED BACK TO 'S240' TYPE CHIPS ON PWA-22110278.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN

TOLERANCES

PLACE	PLACE	ANGLES
±	±	±

MATERIAL

FINISH

DWN	E F ARLANDSON	11/6/85
CHKD	N ZAK	11/6/85
ENGR	R.T. HENNING	5/9/86
MFG	B.J. REILAND	5/9/86
APVD	R.T. HENNING	5/9/86

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
TRANSFER LOGIC

PWA-22110278

PWB-22179691

SIZE C

FSCM NO. 34010

DWG NO. 22179696

LOC. A14

SHEET XFER 1-F

PAGE 1 OF 8

TRANSFER LOGIC (A14-2)

GENERAL

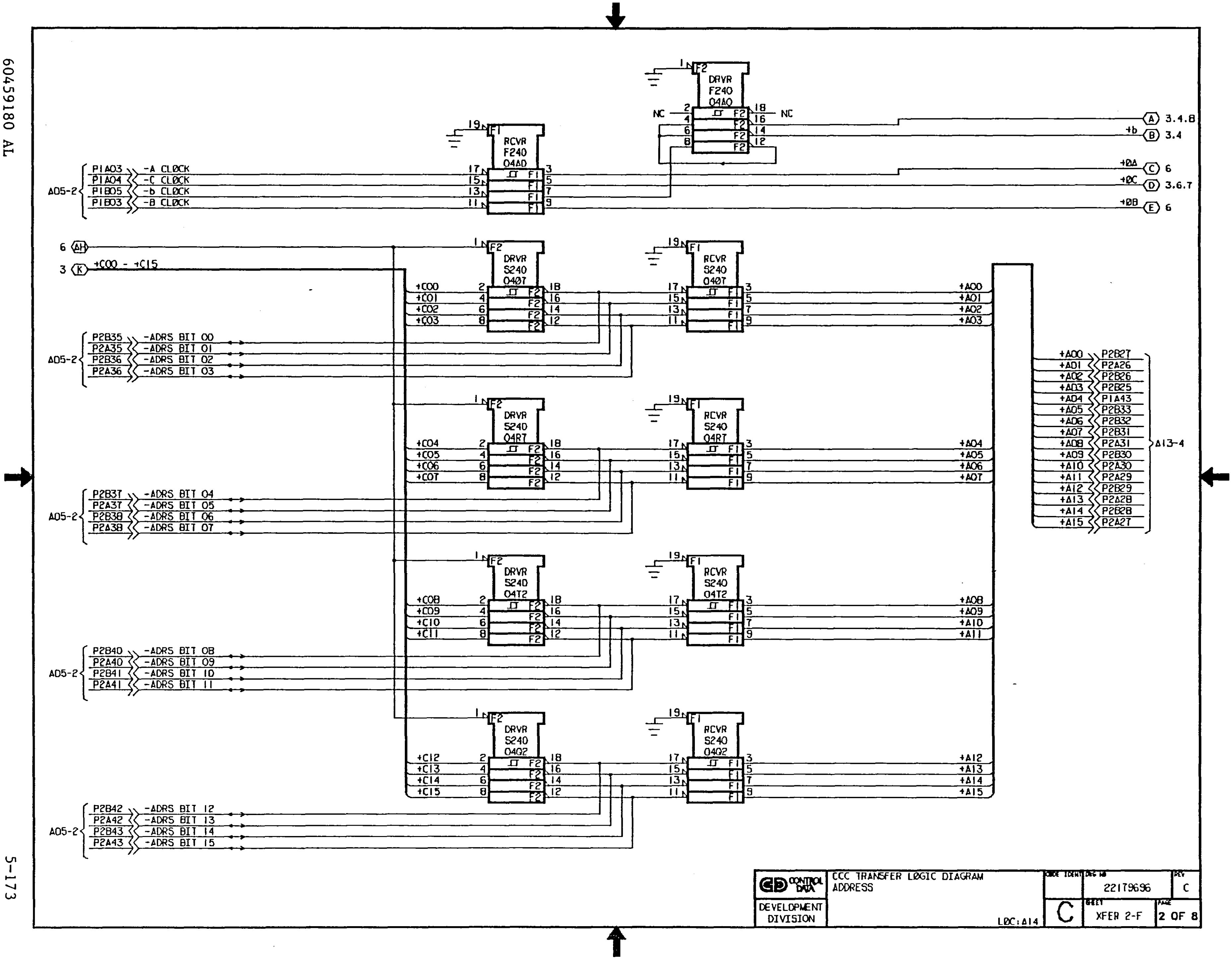
The transfer logic provides the necessary circuits to transfer data from the CYBER channel interface, through memory to the FIPS device, and vice versa, without requiring use of either interface UDI. The processor sets up the transfer operation by initiating a FIPS device interface control sequence to load the transfer registers. The processor then places the CYBER channel interface and/or the FIPS device interface in transfer mode. During the transfer, data is written into a circular buffer by one interface and read from that buffer by the other interface. When an interface is in transfer mode, the interface memory slot time is used by the transfer logic and the interface UDI is unable to reference memory. The UDI regains its memory slot time when the transfer is completed or when a Master Clear signal is received.

ADDRESS BUS RECEIVERS

During a programmable read only memory (PROM) operation, the 16-bit address (bits 00 through 15) is sent from the address bus to the receivers on the bidirectional circuit pins. The address is then sent from the receivers to the PROM (A13-4).

ADDRESS BUS DRIVERS

During a DMA write or read operation, the address (bits C00 through C15) from the CCC address register/counter or CYBER address register/counter (A14-3) is sent from the drivers to the address bus on the same bidirectional circuit pins used by the address bus receivers.



CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LØGIC DIAGRAM
ADDRESS

LØC:A14

CODE IDENT	DWG NO	REV
	22179696	C
C	SHEET XFER 2-F	PAGE 2 OF 8

TRANSFER LOGIC (A14-3)

ADDRESS REGISTER

A 16-bit address (bits AD00 through AD15) is loaded onto the address bus by the FIPS interface UDI (A15) and sent to the address register of the transfer logic before a data transfer starts. The address register routes the address (bits B00 through B15) to the FIPS address counter and also to the CYBER address counter.

FIPS ADDRESS COUNTER

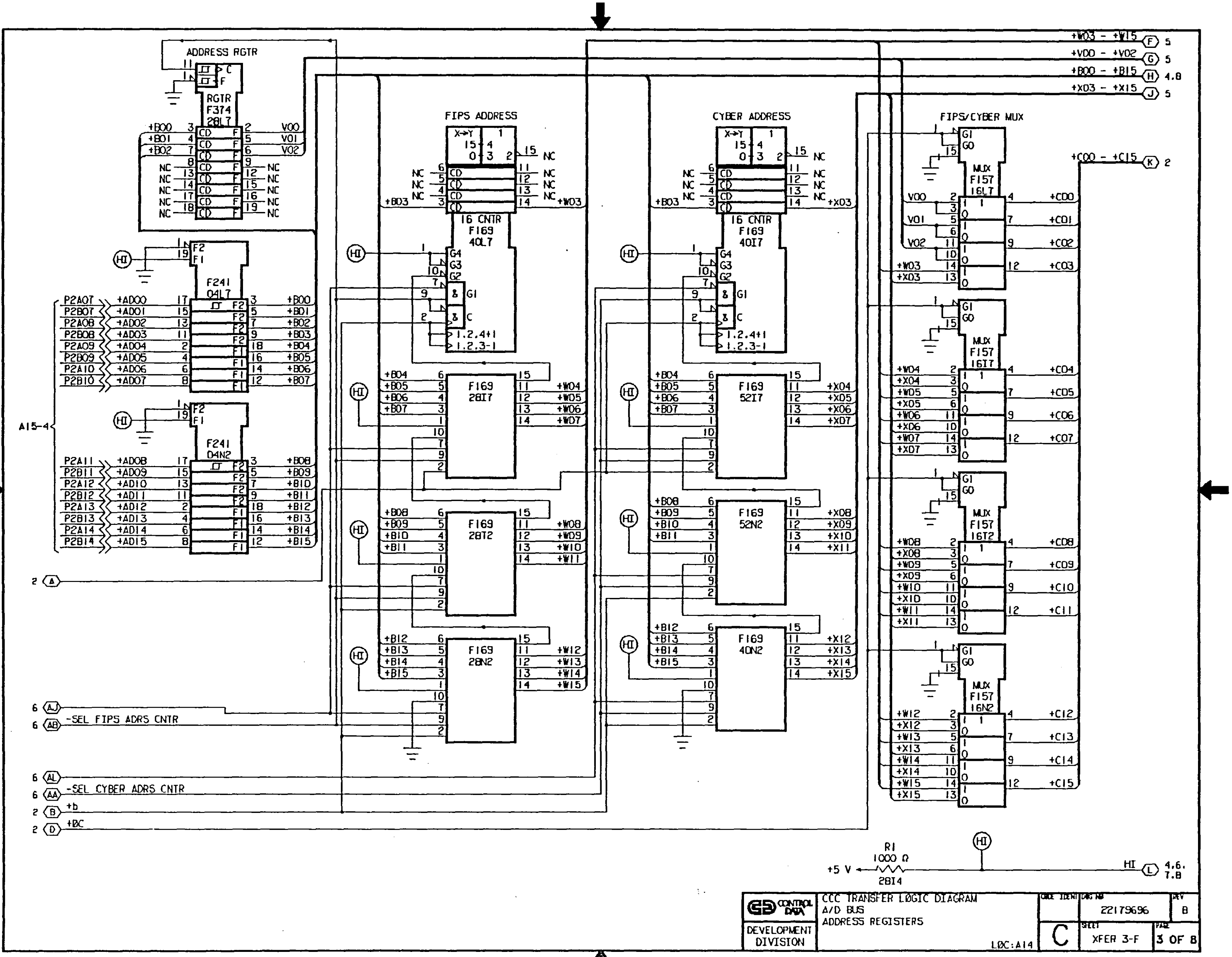
The FIPS address counter provides addresses for data transfers during the memory access time (slot time) of the FIPS interface. The FIPS interface UDI (A15) is disabled at this time. Bits 00, 01, and 02 are held in the address register and do not change during a data transfer. Bits 03 through 15 are held in the FIPS address counter. The counter increments the address each time the FIPS interface reads a word from memory (A10) or writes a word into memory. The counter has a range from 0 to 511 and wraps around to provide a 512-location circular buffer in memory. Bits 00, 01, and 02 form the upper three bits of the address used in the circular buffer.

CYBER ADDRESS COUNTER

The CYBER address counter provides the addresses for data transfers during the memory slot time of the CYBER interface. The address register is the same as that used for the FIPS address counter. The CYBER address counter increments the address each time the CYBER interface reads or writes a memory word. Operation of this counter is identical to that described for the FIPS address counter.

FIPS/CYBER MUTIPLEXER

The OC clock determines the memory slot time for the CYBER interface and gates the CYBER address bits (V00 through V02 and X03 through X15) through the multiplexer. When the OC clock is at a logic 0 level (OC clock not present), the FIPS address bits (V00 through V02 and W03 through W15) are gated through the multiplexer. The multiplexer output bits (C00 through C15) are sent to the address bus drivers (A14-2).



ADDRESS RGTR
RGTR F374 28L7
+B00 +B01 +B02
V00 V01 V02
NC
FIPS ADDRESS
CYBER ADDRESS
FIPS/CYBER MUX
16 CNTR F169 40L7
16 CNTR F169 40I7
X→Y
F241 04L7
F241 04N2
F169 28I7
F169 28T2
F169 28N2
F169 52I7
F169 52N2
F169 40N2
MUX F157 16L7
MUX F157 16I7
MUX F157 16T2
MUX F157 16N2
G4 G3 G2 G1 C
1,2,4+1
1,2,3-1
P2A07 P2B07 P2A08 P2B08 P2A09 P2B09 P2A10 P2B10
P2A11 P2B11 P2A12 P2B12 P2A13 P2B13 P2A14 P2B14
+AD00 +AD01 +AD02 +AD03 +AD04 +AD05 +AD06 +AD07
+AD08 +AD09 +AD10 +AD11 +AD12 +AD13 +AD14 +AD15
+B00 +B01 +B02 +B03 +B04 +B05 +B06 +B07
+B08 +B09 +B10 +B11 +B12 +B13 +B14 +B15
+W03 +W04 +W05 +W06 +W07 +W08 +W09 +W10 +W11 +W12 +W13 +W14 +W15
+X03 +X04 +X05 +X06 +X07 +X08 +X09 +X10 +X11 +X12 +X13 +X14 +X15
+C00 +C01 +C02 +C03 +C04 +C05 +C06 +C07 +C08 +C09 +C10 +C11 +C12 +C13 +C14 +C15
A15-4
HI
+W03 - +W15 (F) 5
+V00 - +V02 (G) 5
+B00 - +B15 (H) 4,8
+X03 - +X15 (J) 5
+C00 - +C15 (K) 2
2 (A)
6 (AJ)
6 (AB) -SEL FIPS ADRS CNTR
6 (AL)
6 (AA) -SEL CYBER ADRS CNTR
2 (B) +b
2 (D) +ØC
R1 1000 Ω 28I4
+5 V
HI (L) 4,6, 7,8

CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LOGIC DIAGRAM
A/D BUS
ADDRESS REGISTERS

LOC:A14

C

22179696

B

XFER 3-F

3 OF 8

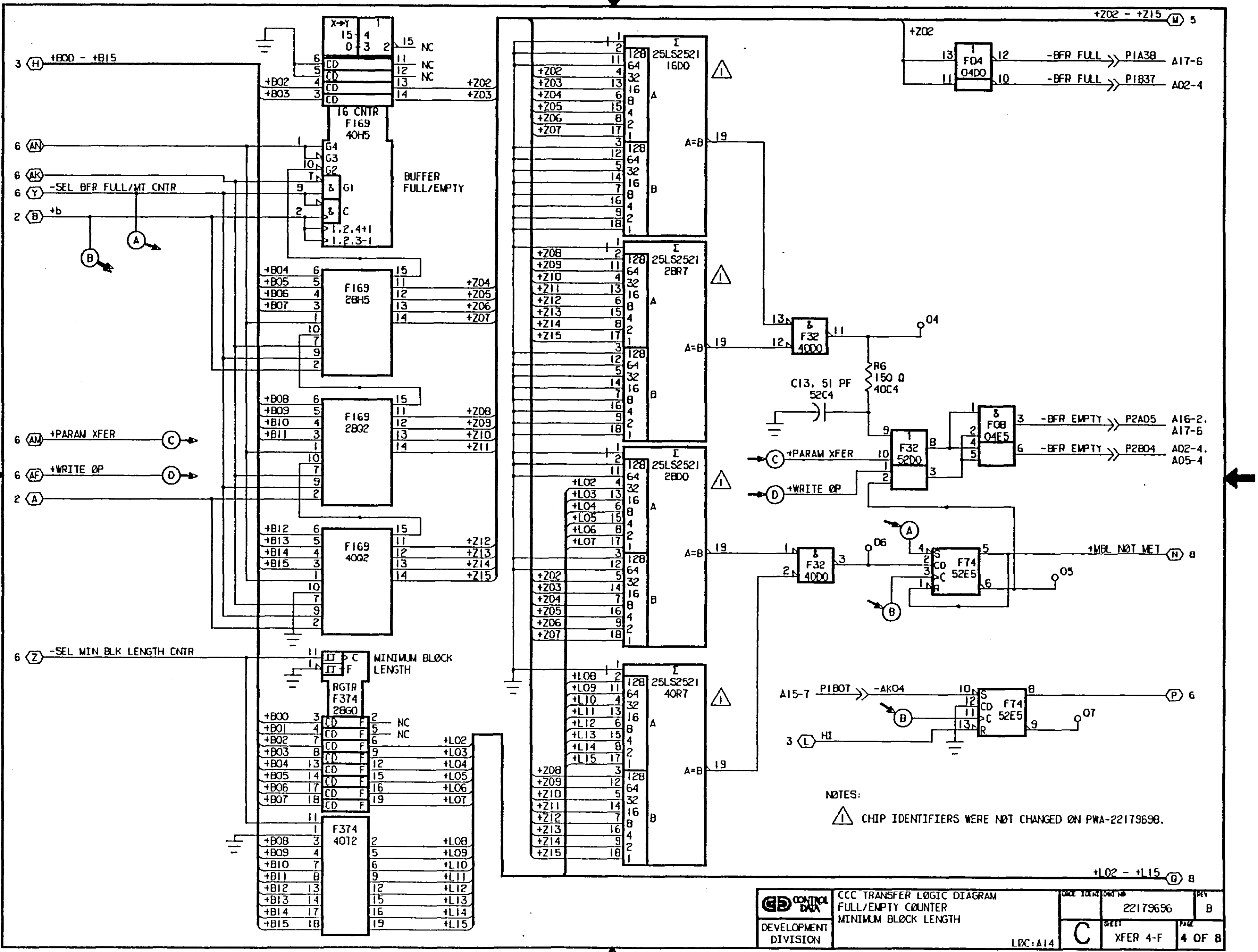
TRANSFER LOGIC (A14-4)

BUFFER FULL/EMPTY COUNTER

This is a 14-bit counter that increments when a data word is written into the 8K-location circular buffer in memory (A10). It decrements when a data word is read from the buffer. The output of the counter is decoded to provide either a Buffer Full (8192_{10} or 2000_{16} count) or Buffer Empty (0 count) signal to the CYBER interface and FIPS interface data control circuits. Data cannot be written into memory during a buffer full condition or read from memory during a buffer empty condition. This counter is loaded by the processor via the FIPS device interface.

MINIMUM BLOCK LENGTH (MBL) REGISTER

This is a 14-bit register that contains the value of the minimum number of words required in a block of data. The output of the MBL register is compared to the output of the buffer full/empty counter during a read operation. A buffer empty signal is sent to the CYBER interface (A02-4) until the buffer full/empty counter reaches a value equal to that set in the MBL counter. This prohibits data blocks shorter than the required minimum block length from being transferred to the CYBER interface. The contents of the MBL register are not used during a write operation. This register is loaded by the processor via the FIPS device interface.



NØTES:

⚠ CHIP IDENTIFIERS WERE NØT CHANGED ØN PWA-22179698.

CONTROL DATA
DEVELOPMENT DIVISION

CCC TRANSFER LØGIC DIAGRAM
FULL/EMPTY CØUNTER
MINIMUM BLØCK LENGTH

LØC:A14

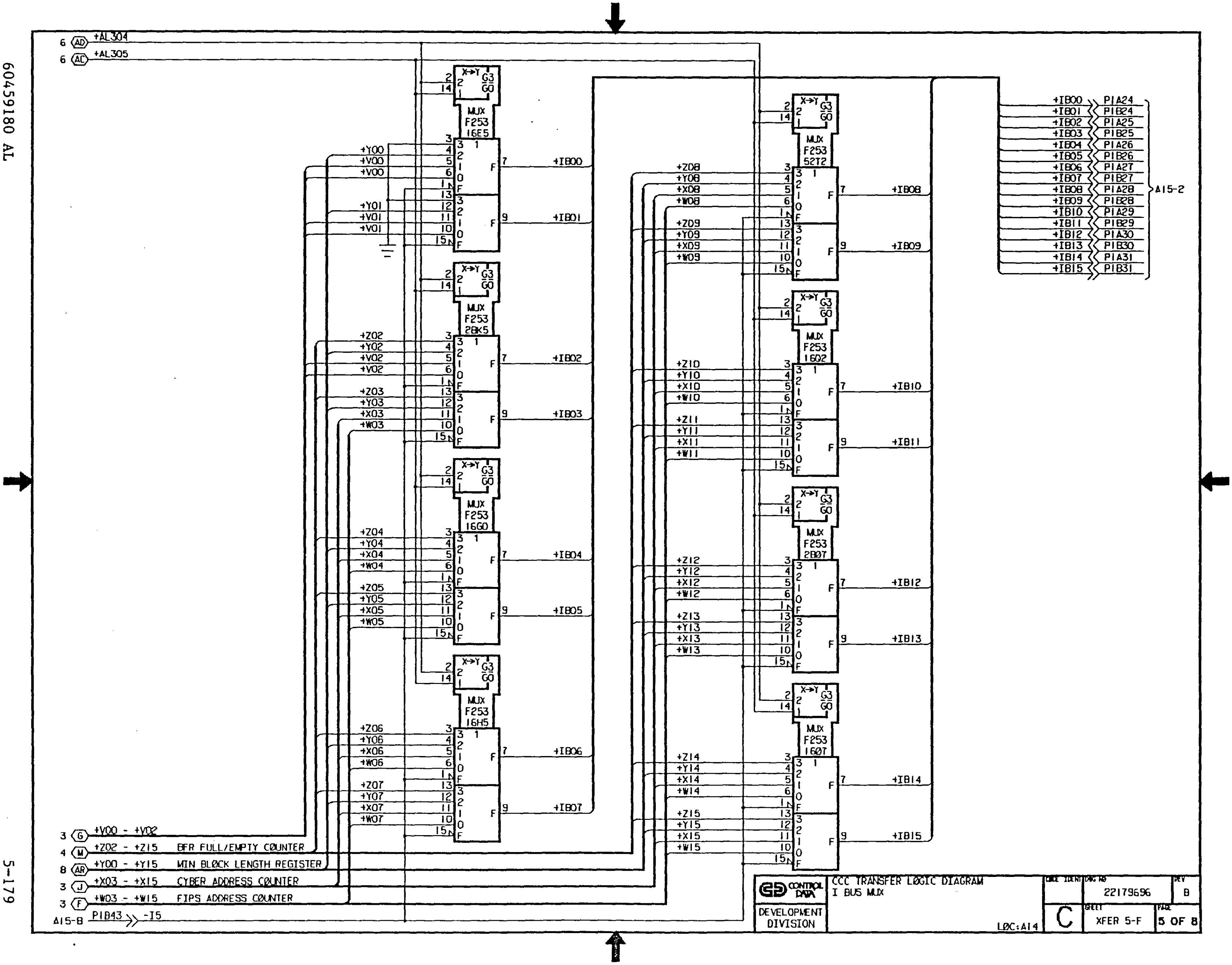
CODE IDENT	DWG NO	REV
C	22179696	B
SHEET	XFER 4-F	4 OF 8

TRANSFER LOGIC (A14-5)

I BUS MUX

Addressable latch bits AL304 and AL305 are decoded to provide enables to the multiplexers. The following information is gated to the I bus for the various combinations of the enable bits.

AL304	AL305	I Bus Information
0	0	FIPS address (bits W03 through W15 and V00 through V02)
0	1	CYBER address (bits W03 through W15 and V00 through V02)
1	0	Minimum block length (bits Y00 through Y15)
1	1	Buffer full/empty count (bits Z02 through Z15, also note that Mux bits IB00 and IB01 become zeros because of the grounded inputs at U34 pins 3 and 13)



CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LOGIC DIAGRAM
I BUS MUX

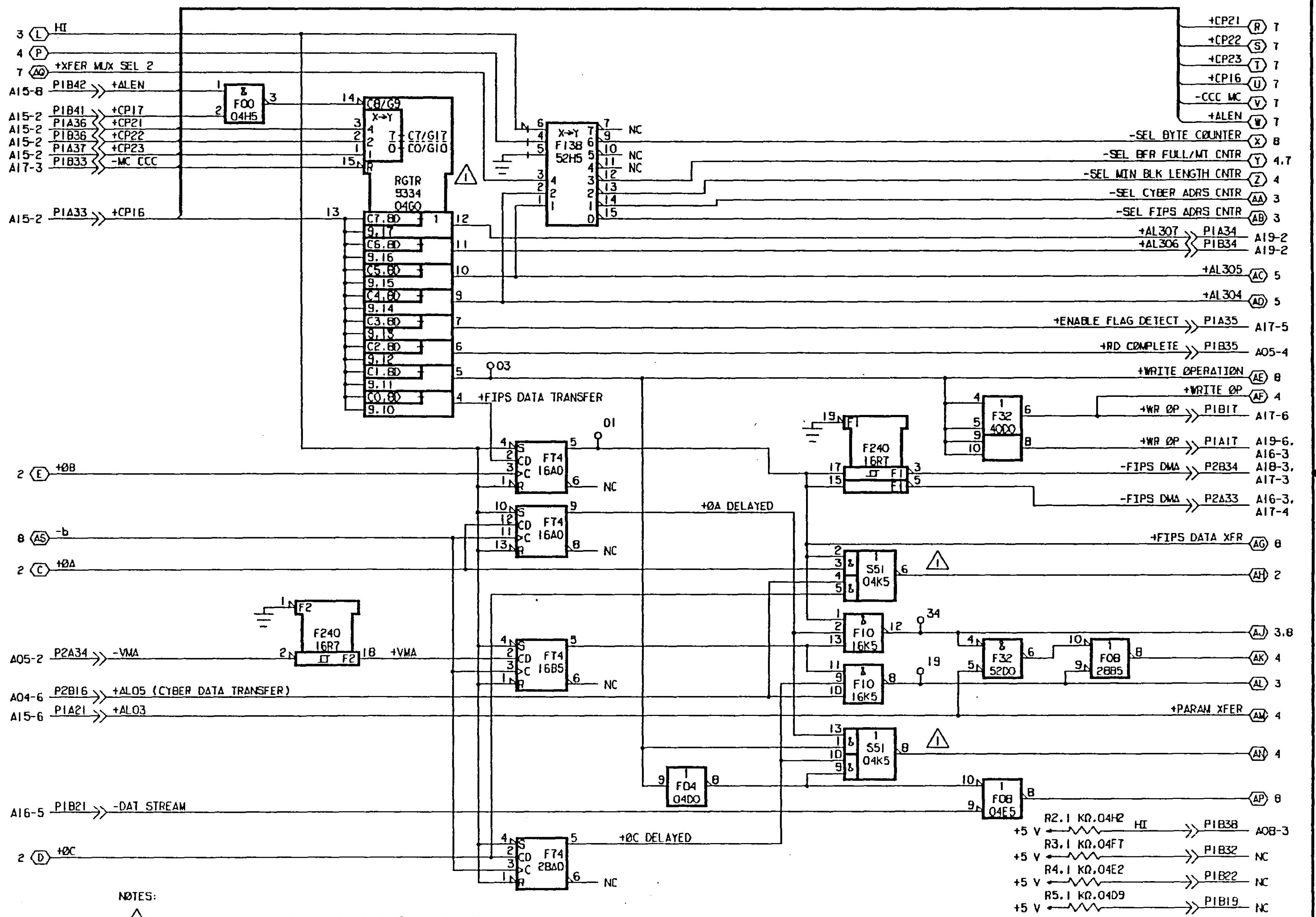
LOC:A14

CODE IDENT	DWG NO	REV
	22179696	B
C	SHEET XFER 5-F	PAGE 5 OF 8

TRANSFER LOGIC (A14-6)

ADDRESSABLE LATCH REGISTER

The outputs of the addressable latch register are selected by microcode bits CP17, CP21, CP22, and CP23 from the FIPS interface UDI (A15-2). Register outputs AL304 and AL305, and AL306 and AL307 are used to gate information through the I bus multiplexers (A14-5 and A19-2) to the I bus. The Write Operation output signal of the register functions as a direction latch that is used to indicate either a read or write operation. When cleared, a read operation is performed and data flow is from the FIPS device interface to the CYBER channel interface. When set, a write operation is performed and data flow is from the CYBER channel interface to the FIPS device interface.



NOTES:

⚠1 CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22179698.

CONTROL DATA

DEVELOPMENT DIVISION

CCC TRANSFER LOGIC DIAGRAM
ADDRESSABLE LATCH

LOC:A14

C

22179696

REV B

XFER 6-F

6 OF 8

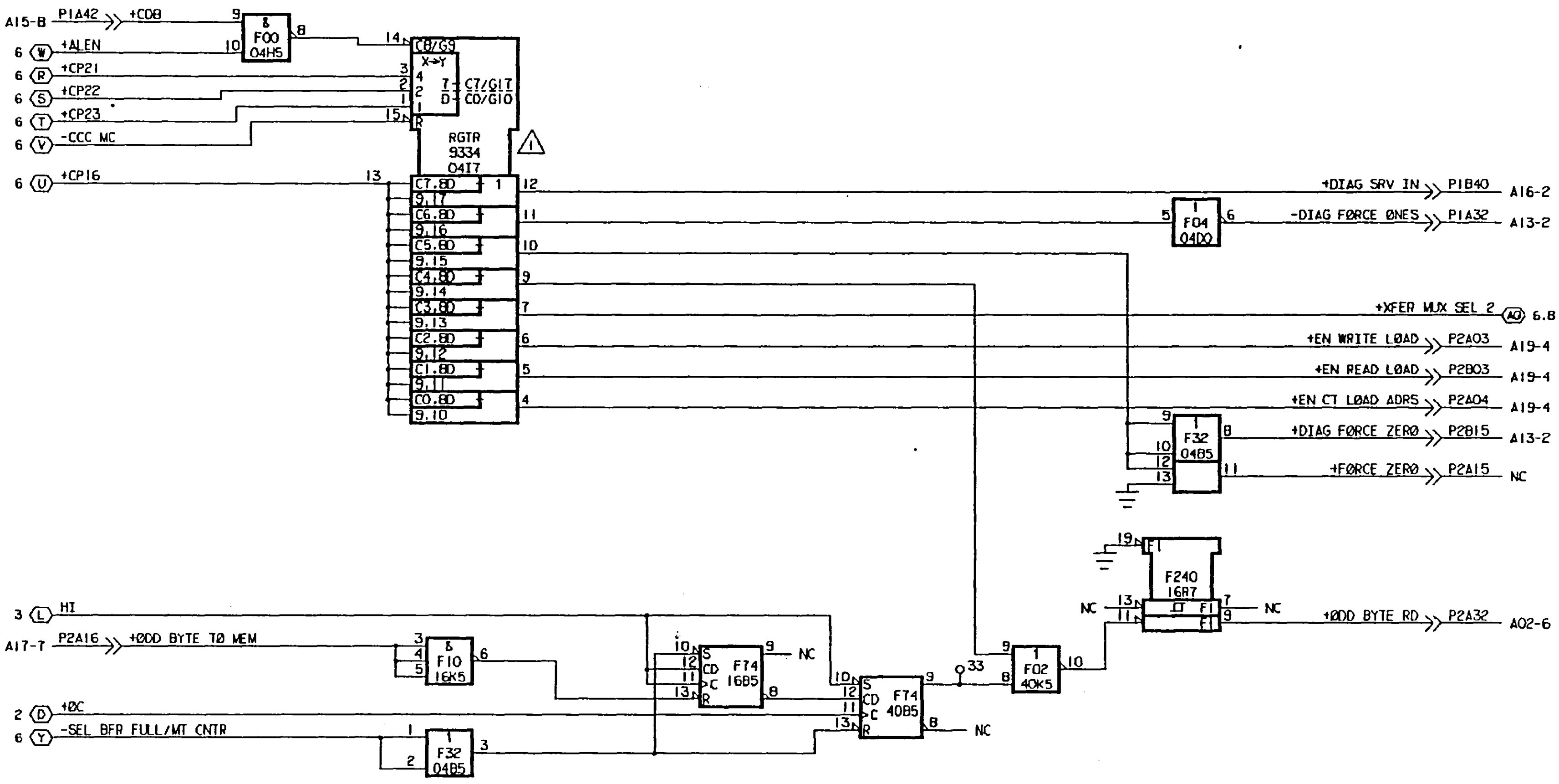
TRANSFER LOGIC (A14-7)

ADDRESSABLE LATCH REGISTER

The outputs of the addressable latch register are selected by microcode bits CP21, CP22, and CP23 from the FIPS interface UDI (A15-2).

Register outputs are used to control diagnostic functions and to enable loading code tables.

The Transfer Mux Select 2 signal is used to enable the byte counter (A14-8) output into the I bus multiplexer (A14-5).



NOTES:

⚠1 CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22179698.

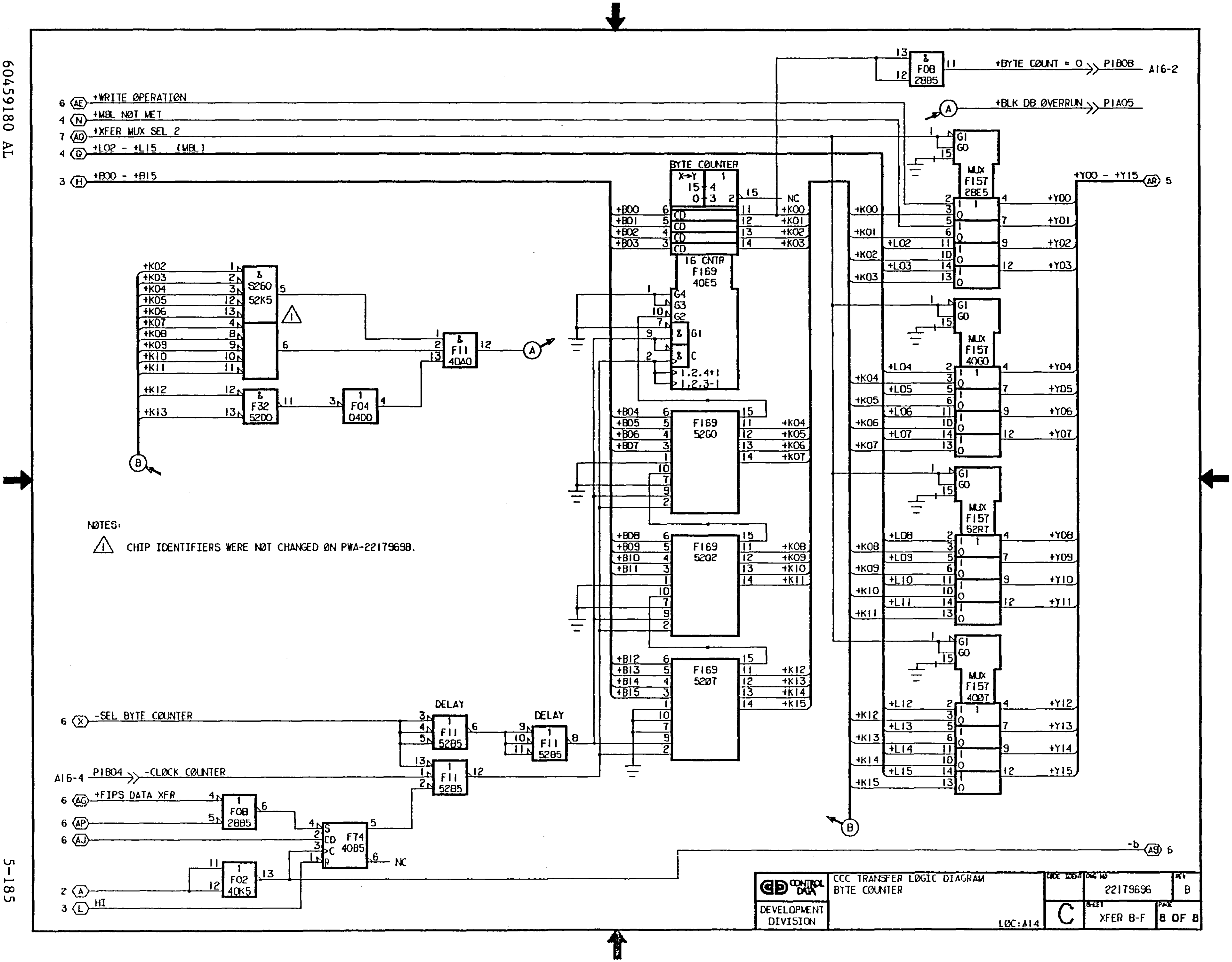
CONTROL DATA	CCC TRANSFER LOGIC DIAGRAM ADDRESSABLE LATCH	CODE IDENT	DWG NO 22179696	REV B
DEVELOPMENT DIVISION	LOC:A14	C	SHEET XFER 7-F	PAGE 7 OF 8

TRANSFER LOGIC (A14-8)

BYTE COUNTER

The byte counter is a 16-bit counter that may be used to terminate a FIPS data transfer without waiting for the FIPS device to send a Status-In signal (A16-2). The counter is loaded with one less than the number of bytes that are to be transferred. During a write operation, the count is decremented by one count each time a byte is accepted by the FIPS device. During a read operation, the count is decremented by one count each time a byte is received from the FIPS device and written into coupler memory (A10).

The byte counter output is sent to a multiplexer. The multiplexer gates either the byte counter bits or the MBL counter (A14-4) bits to the I bus multiplexer (A14-5). The Byte Count = 0 signal is sent to the control flag register of the stream logic (A16-2).



NOTES:

1. CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22179698.

CONTROL DATA
DEVELOPMENT DIVISION

CCC TRANSFER LOGIC DIAGRAM
BYTE COUNTER

LOC:A14

CODE IDENT	DWG NO	REV
C	22179696	B
SHEET	XFER 8-F	PAGE 8 OF 8

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SHEET									REVISION RECORD					
9	8	7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	NZ
A	B	A	A	B	A	B	A	B	CA46483	SEE C.O.	MES	06/85	NZ	NZ
C	C	C	C	C	C	C	C	C	CA48235	ADDED COVER, RE-INTERSHEET	MES	2/26/87	NS	NS
C	C	C	C	C	C	C	C	D	CA48888	NEW PWA NUMBER	KMS	5/11/87	NS	NS

NOTES:

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	R T HENNING	01/85
MFG	B J REILAND	01/85
APVD	R T HENNING	01/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

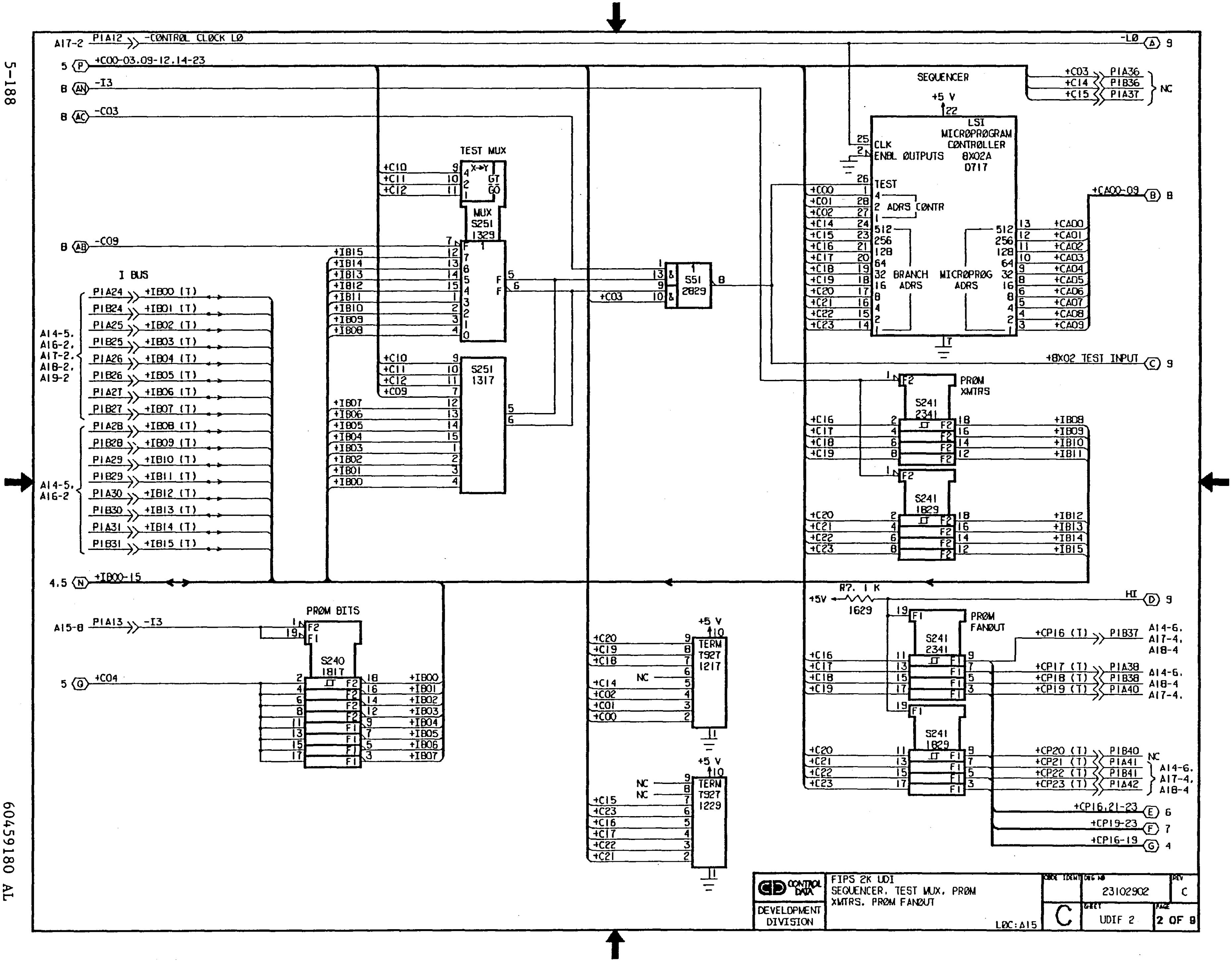
TITLE

LOGIC DIAGRAM
FSC UDI WIRED (2K)

PWA-22136087
PWB-52803444

SIZE C
FSCM NO. 34010
DWG NO. 23102900

LOC: A15
SHEET UDIF 1
PAGE 1 OF 9

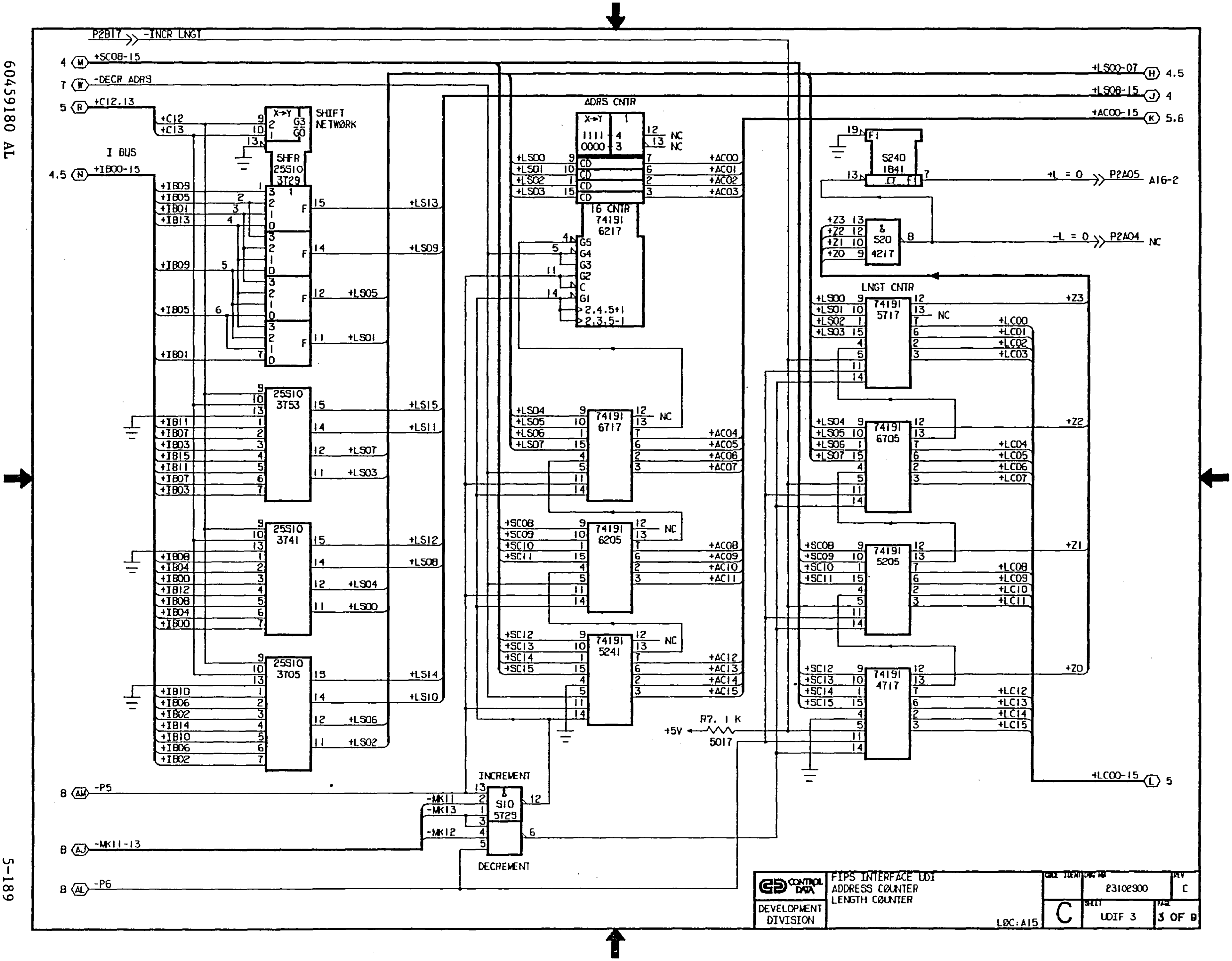


CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI
SEQUENCER, TEST MUX, PROM XMTRS, PROM FANOUT

LOC:A15

CODE IDENT	DWG NO	REV
C	23102902	C
	SHEET UDIF 2	PAGE 2 OF 8

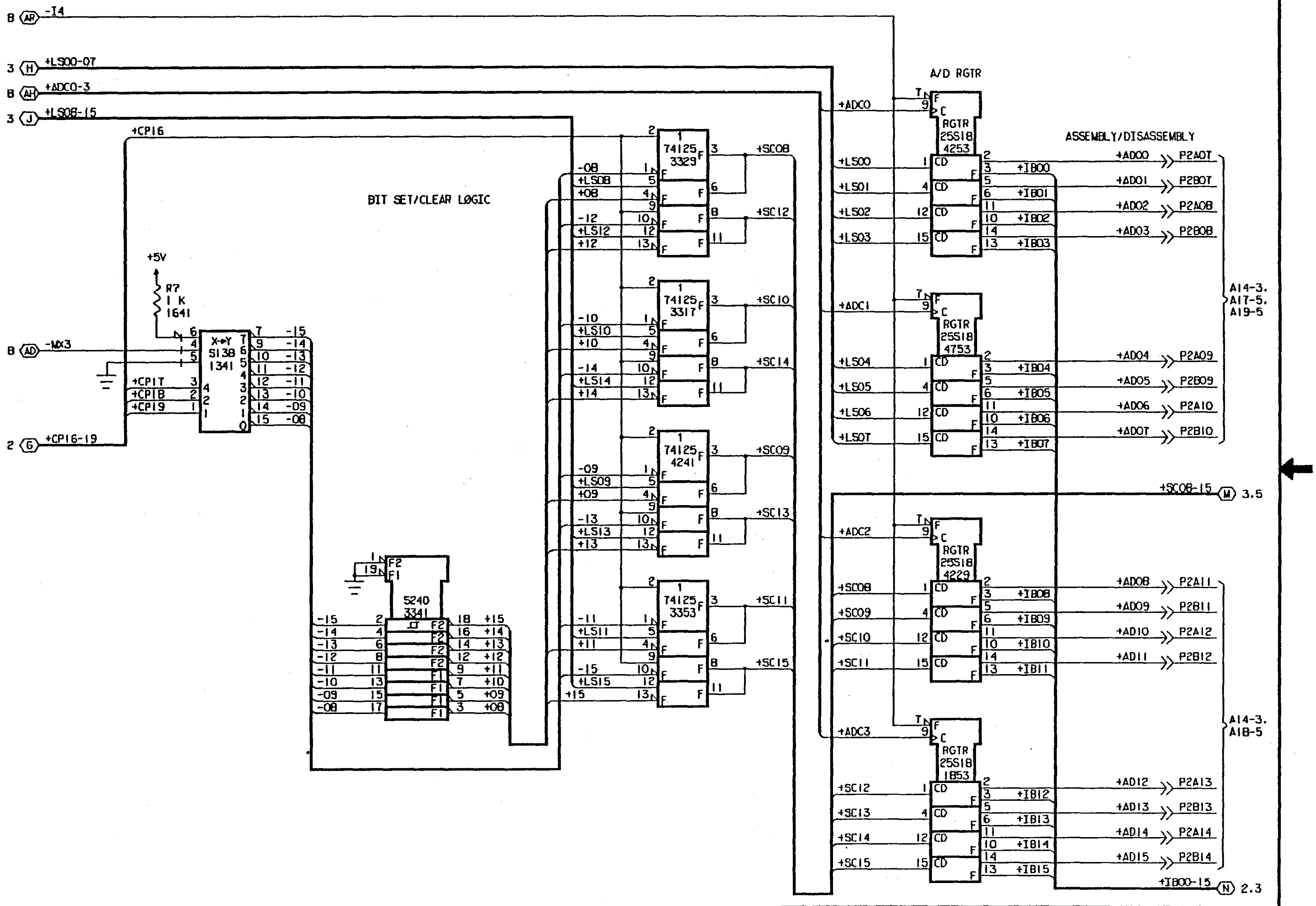


FIPS INTERFACE UDI
ADDRESS COUNTER
LENGTH COUNTER

CONTROL DATA
DEVELOPMENT DIVISION

LOC: A15

DWG NO 23102900
REV C
SIZE C
SHEET UDIF 3
PAGE 3 OF 8



CONTROL DATA

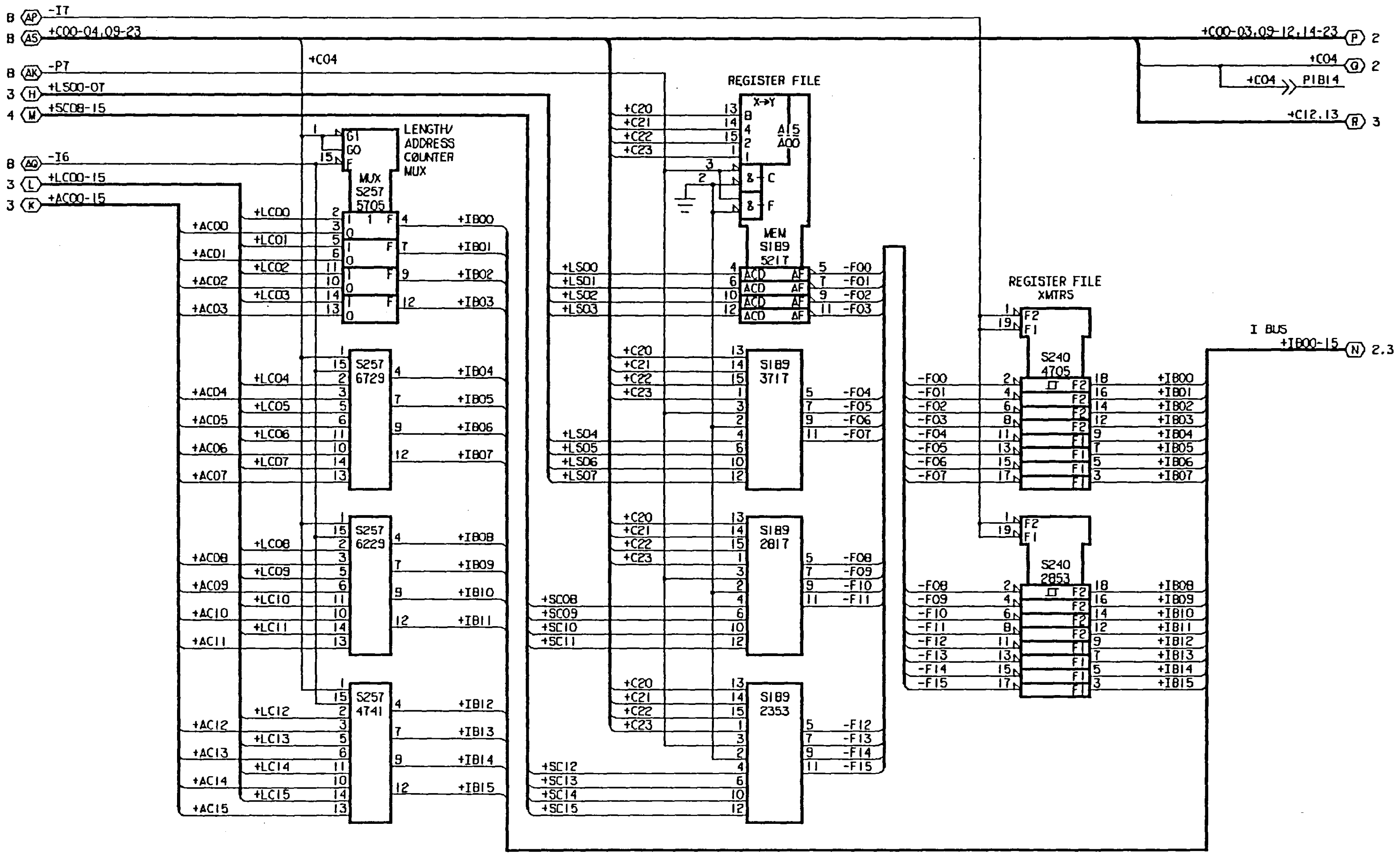
DEVELOPMENT DIVISION

FIPS INTERFACE UDI
BIT SET/CLEAR, ASSEMBLY/
DISASSEMBLY (A/D) RGTR

LØC: A15

CODE IDENT	DWG NO	REV
	23102900	C

SIZE	SHEET	PAGE
C	UDIF 4	4 OF 9



B (AP) -I7
B (AS) +C00-04,09-23
B (AK) -P7
3 (H) +LS00-07
4 (M) +SC08-15
B (AQ) -I6
3 (L) +LC00-15
3 (K) +AC00-15
+C04
LENGTH/ ADDRESS COUNTER MUX
MUX S257 5705
S257 6729
S257 6229
S257 4741
+AC00 +AC01 +AC02 +AC03 +AC04 +AC05 +AC06 +AC07 +AC08 +AC09 +AC10 +AC11 +AC12 +AC13 +AC14 +AC15
+LC00 +LC01 +LC02 +LC03 +LC04 +LC05 +LC06 +LC07 +LC08 +LC09 +LC10 +LC11 +LC12 +LC13 +LC14 +LC15
+IB00 +IB01 +IB02 +IB03 +IB04 +IB05 +IB06 +IB07 +IB08 +IB09 +IB10 +IB11 +IB12 +IB13 +IB14 +IB15
REGISTER FILE
X→Y
A15 A00
MEM S189 5217
S189 3717
S189 2817
S189 2353
+C20 +C21 +C22 +C23
+LS00 +LS01 +LS02 +LS03 +LS04 +LS05 +LS06 +LS07
+SC08 +SC09 +SC10 +SC11 +SC12 +SC13 +SC14 +SC15
ACD AF
-F00 -F01 -F02 -F03 -F04 -F05 -F06 -F07 -F08 -F09 -F10 -F11 -F12 -F13 -F14 -F15
REGISTER FILE XMTRS
S240 4705
S240 2853
F2 F1
+C00-03,09-12,14-23 (P) 2
+C04 (Q) 2
+C04 P1B14
+C12,13 (R) 3
I BUS
+IB00-15 (N) 2,3

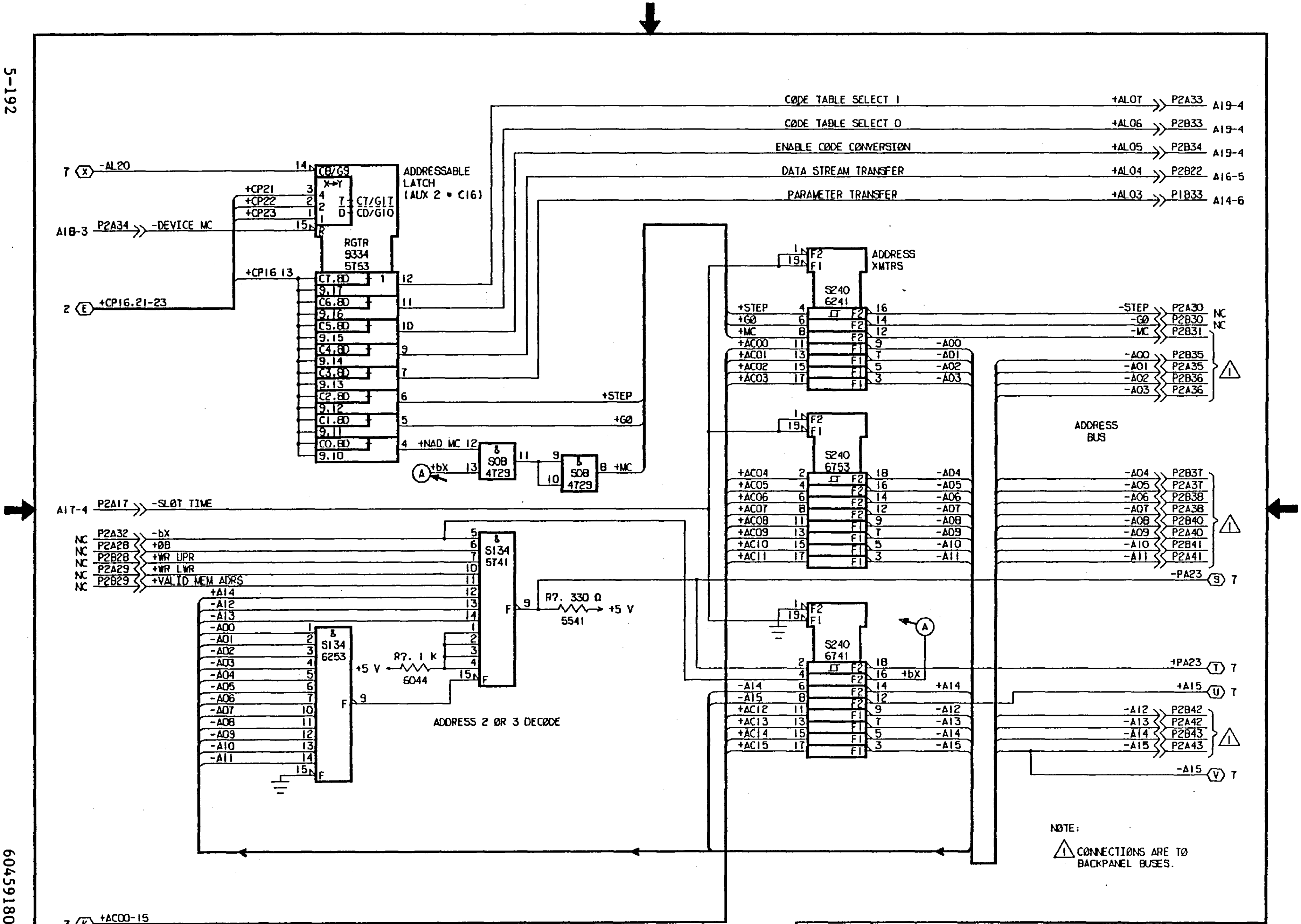
CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE UDI
LENGTH/ADDRESS MUX, REGISTER
FILE, REGISTER FILE XMTRS

LØC:A15

CODE IDENT	DWG NO	REV
C	23102900	C
	SHEET UDIF 5	PAGE 5 OF 9



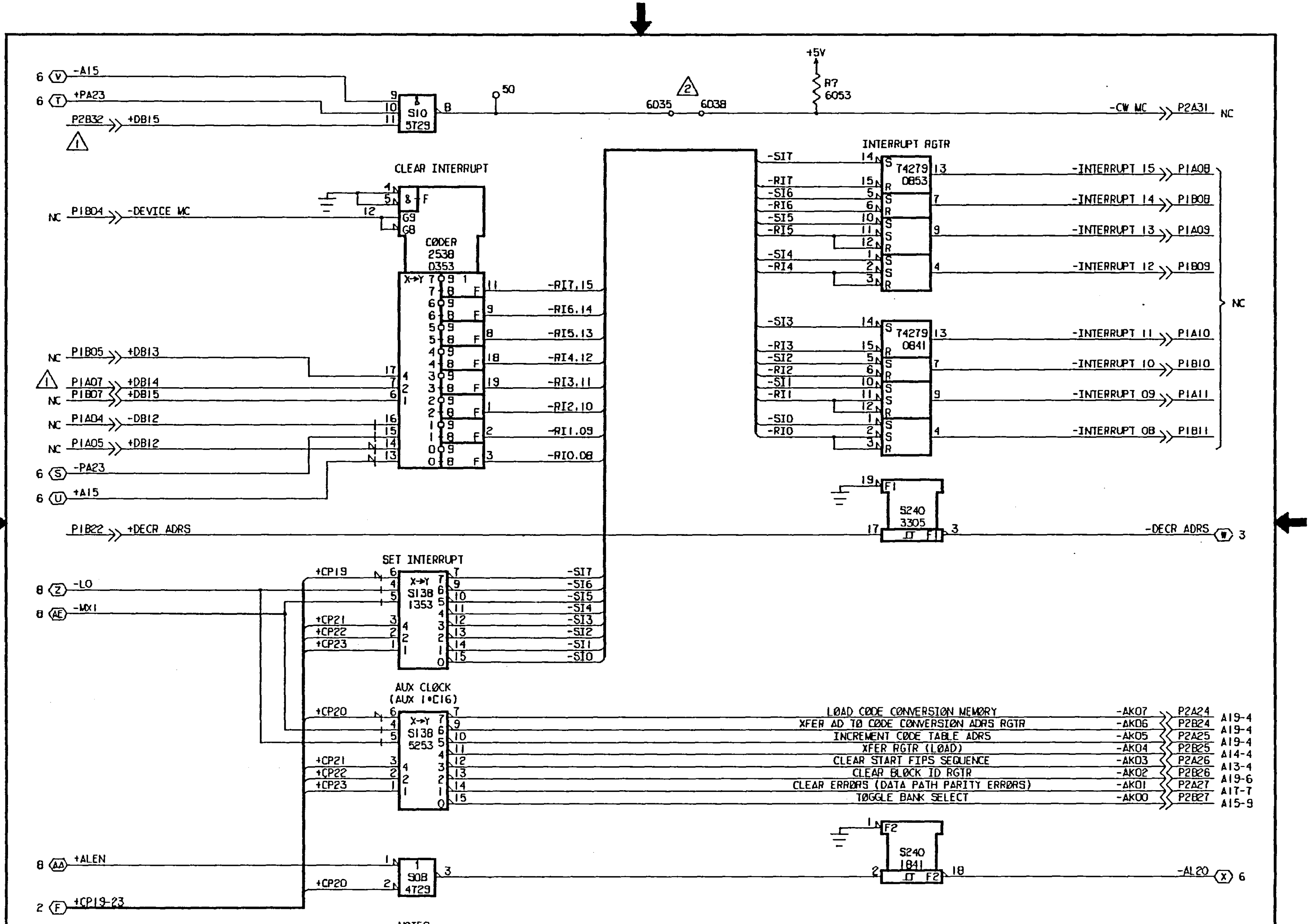
CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE UDI
ADDRESSABLE LATCH, ADRS 2/3
DECODE, ADDRESS XMTRS

LOC:A15

CODE IDENT	DWG NO	REV
C	23102900	C
	SHEET UDIF 6	PAGE 6 OF 9



NOTES:

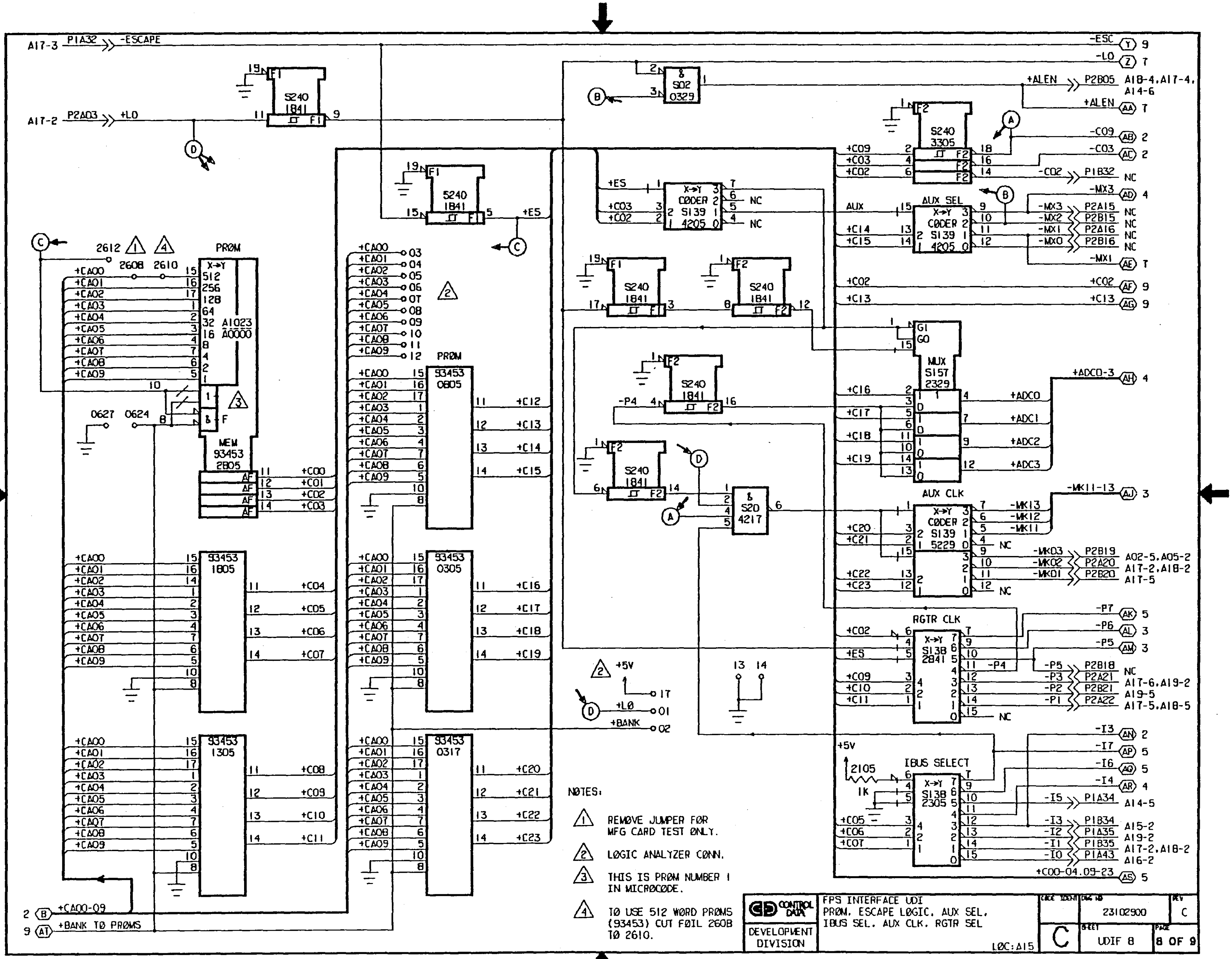
1. P2B32 AND P1A07 ARE TIED TOGETHER ON THE BACKPANEL.
2. REMOVE JUMPER FOR MFG CARD TEST ONLY.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE UDI
SET/CLR INTERRUPTS,
INTERRUPT RGTR, AUX CLOCK

LOC: A15

CODE IDENT	DWG NO	REV
C	23102900	C
SHEET	UDIF 7	PAGE 7 OF 9



NOTES:

1. REMOVE JUMPER FOR MFG CARD TEST ONLY.
2. LOGIC ANALYZER CONN.
3. THIS IS PROM NUMBER 1 IN MICROCODE.
4. TO USE 512 WORD PROMS (93453) CUT FOIL 2608 TO 2610.

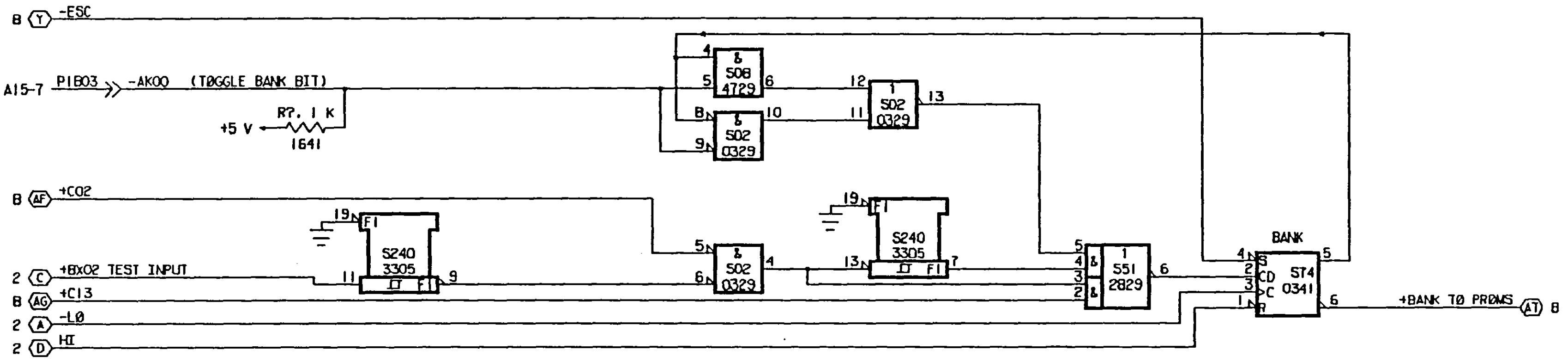
CONTROL DATA

DEVELOPMENT DIVISION

FPS INTERFACE UDI
PROM, ESCAPE LOGIC, AUX SEL,
IBUS SEL, AUX CLK, RGTR SEL

LOC: A15

CODE IDENT	DWG NO	REV
	23102900	C
C	SHEET UDIF 8	PAGE 8 OF 9



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE UDI
BANK SELECT

LOC:A15

CODE IDENT
C

DWG NO
23102900

REV
C

SHEET
UDIF 9

PAGE
9 OF 9

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PAGE									REVISION RECORD					
9	8	7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A	A	A		CLASS A RELEASED	MES	12/84	NZ	NZ
B	B	B	B	B	B	B	B	B	CA48097	INACTIVE, FOR SERVICE USE ONLY SUPERSEDED BY 22110162	MES	8/20/86	NS	NS
C	C	C	C	C	C	C	C	C	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/26/87	NS	NS
C	C	C	C	C	C	C	C	D	CA48888	NEW PWA NUMBER	KMS	5/11/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±

MATERIAL

FINISH

DWN	M E SCHMIDT	12/84
CHKD	N ZAK	12/84
ENGR	R T HENNING	1/18/85
MFG	B J REILAND	1/17/85
APVD	R T HENNING	1/18/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
FIPS 2K UDI

PWA-22136088

PWB-67046086

SIZE C

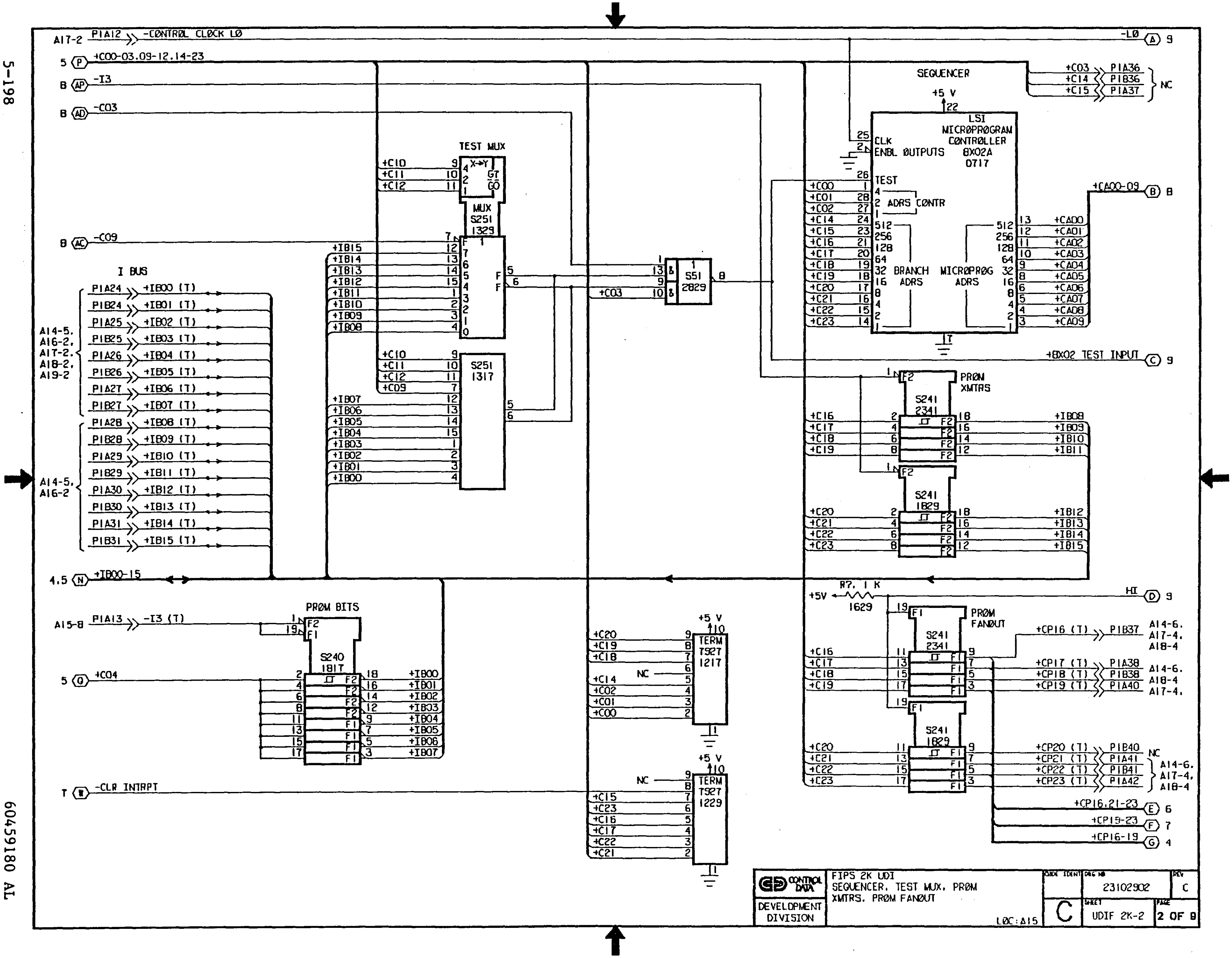
FSCM NO. 34010

DWG NO. 23102902

LOC: A15

SHEET UDIF 2K-1

PAGE 1 OF 9



CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI
SEQUENCER, TEST MUX, PROM XMTRS, PROM FANOUT

LOC: A15

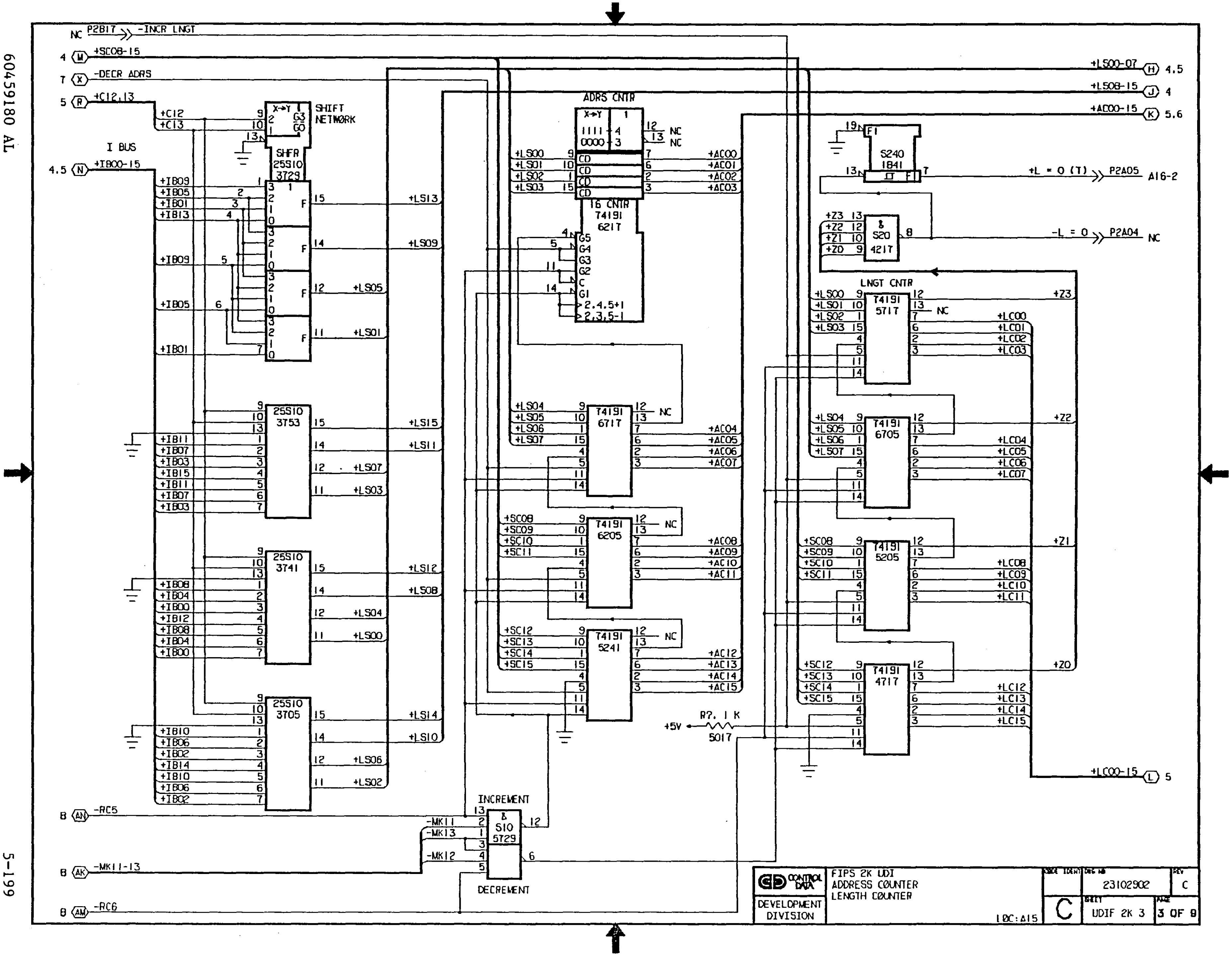
C

DWG NO 23102902

REV C

SHEET UDIF 2K-2

PAGE 2 OF 8

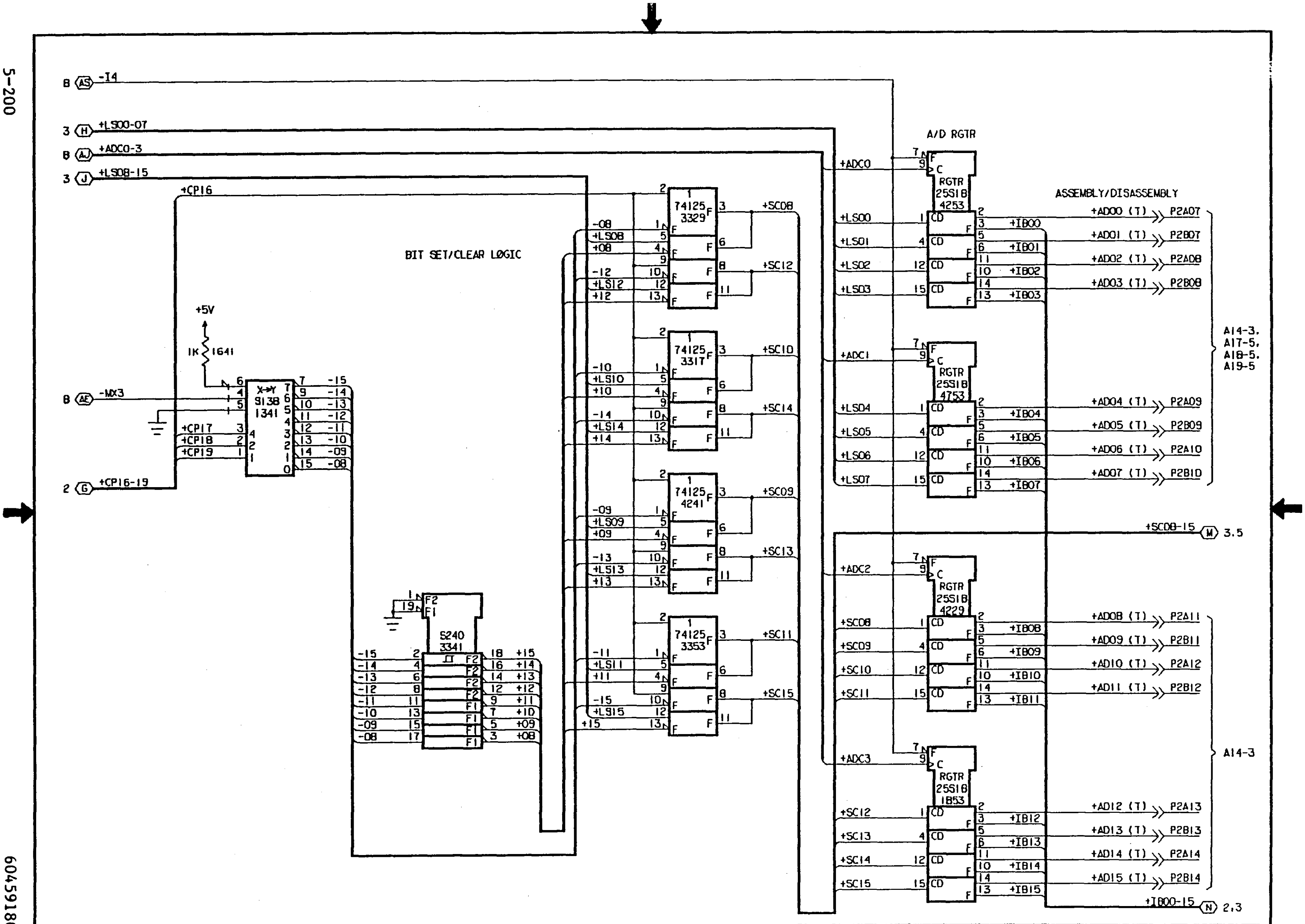


CONTROL DATA
DEVELOPMENT DIVISION

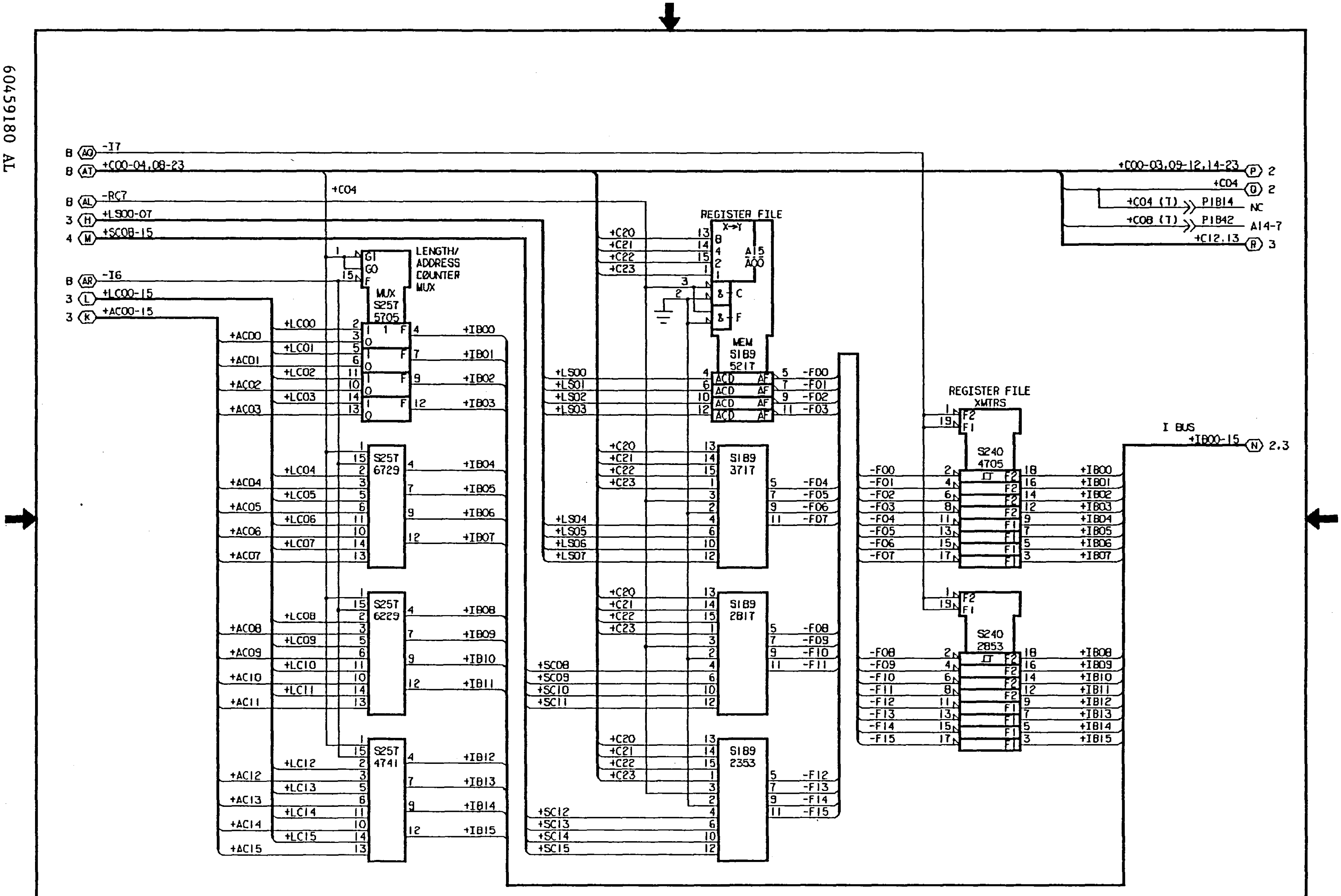
FIPS 2K UDI
ADDRESS COUNTER
LENGTH COUNTER

LOC: A15

DWG NO 23102902
REV C
C
SHEET UDIF 2K 3
PAGE 3 OF 9



CONTROL DATA DEVELOPMENT DIVISION	FIPS 2K UDI BIT SET/CLEAR, ASSEMBLY/ DISASSEMBLY (A/D) RGTR LØC: A15	C	DWG NO 23102902 SHEET UDIF 2K 4	REV C PAGE 4 OF 9


B (AQ) -I7
B (AT) +C00-04,08-23
B (AL) -RC7
3 (H) +LS00-07
4 (M) +SC08-15
B (AR) -I6
3 (L) +LC00-15
3 (K) +AC00-15
+C04
LENGTH/ ADDRESS COUNTER MUX
MUX S257 5705
S257 6729
S257 6229
S257 4741
REGISTER FILE
A15 A00
MEM S189 5217
S189 3717
S189 2817
S189 2353
REGISTER FILE XMTRS
S240 4705
S240 2853
+C00-03,09-12,14-23 (P) 2
+C04 (Q) 2
+C04 (T) P1B14 NC
+C08 (T) P1B42 A14-7
+C12,13 (R) 3
I BUS
+IB00-15 (N) 2,3
+IB00 +IB01 +IB02 +IB03 +IB04 +IB05 +IB06 +IB07
+IB08 +IB09 +IB10 +IB11 +IB12 +IB13 +IB14 +IB15
-F00 -F01 -F02 -F03 -F04 -F05 -F06 -F07
-F08 -F09 -F10 -F11 -F12 -F13 -F14 -F15
+C20 +C21 +C22 +C23
+LS00 +LS01 +LS02 +LS03 +LS04 +LS05 +LS06 +LS07
+SC08 +SC09 +SC10 +SC11 +SC12 +SC13 +SC14 +SC15
+LC00 +LC01 +LC02 +LC03 +LC04 +LC05 +LC06 +LC07
+LC08 +LC09 +LC10 +LC11 +LC12 +LC13 +LC14 +LC15
+AC00 +AC01 +AC02 +AC03 +AC04 +AC05 +AC06 +AC07
+AC08 +AC09 +AC10 +AC11 +AC12 +AC13 +AC14 +AC15

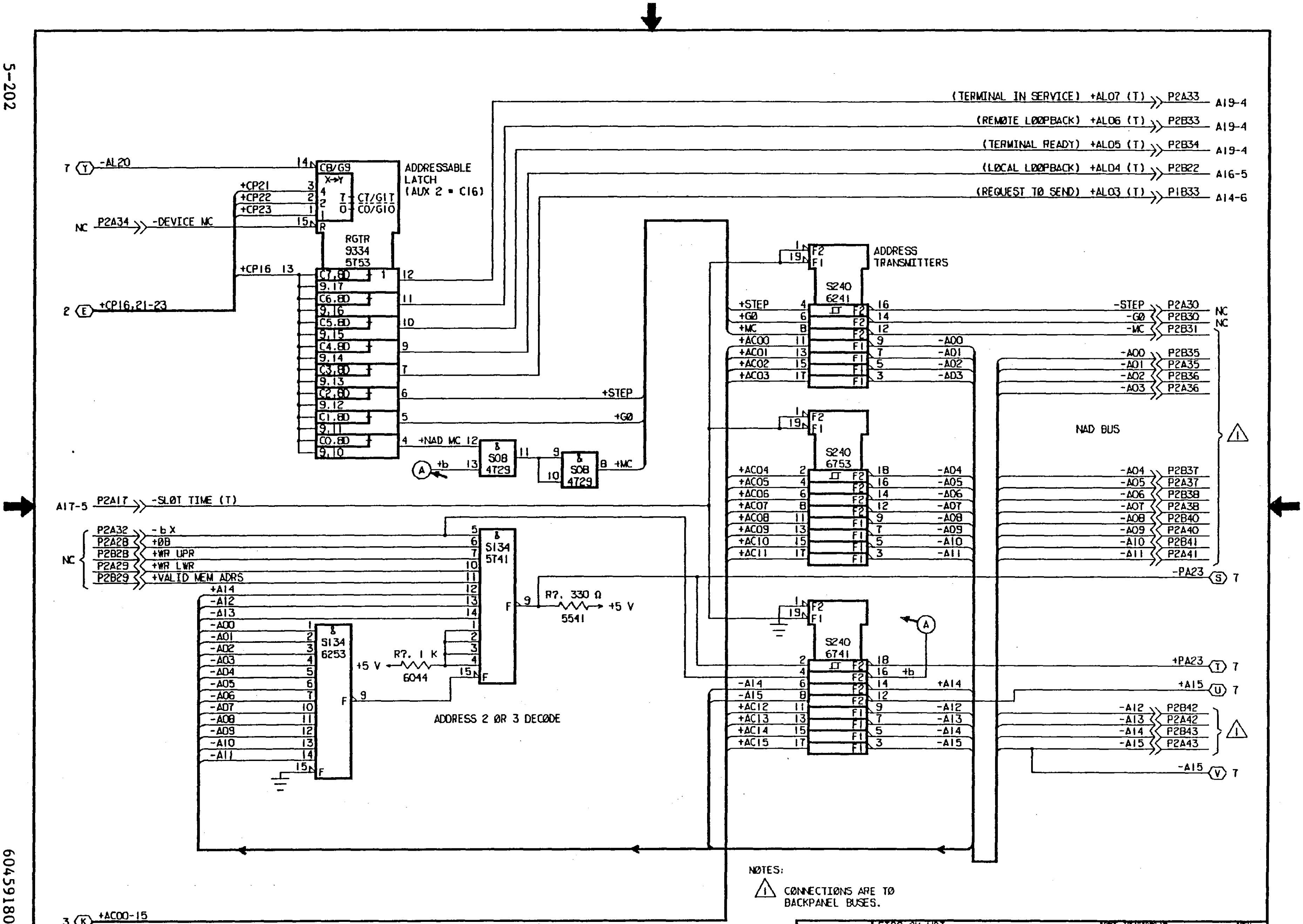
CONTROL DATA

DEVELOPMENT DIVISION

FIPS 2K UDI
LENGTH/ADDRESS MUX, REGISTER FILE, REGISTER FILE XMTRS

LOC:A15

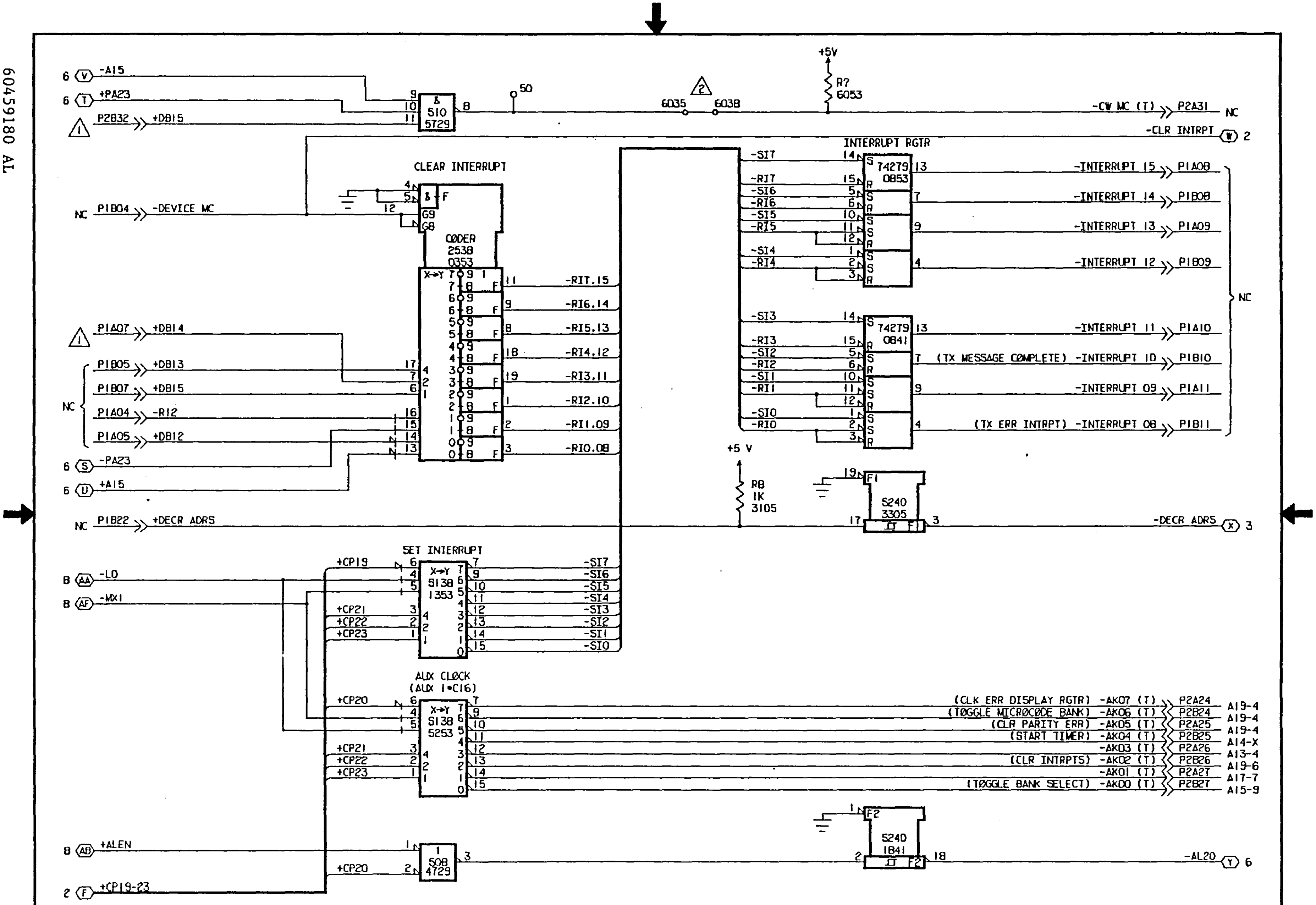
CODE IDENT	DWG NO	REV
C	23102902	C
	SHEET UDIF 2K 5	PAGE 5 OF 9



NOTES:

⚠1 CONNECTIONS ARE TO BACKPANEL BUSES.

CONTROL DATA DEVELOPMENT DIVISION	FIPS 2K UDI ADDRESSABLE LATCH. ADDR 2/3 DECODE. ADDRESS TRANSMITTERS LOC:A15	CAGE IDENT	DWG NO 23102902	REV C
		SIZE C	SHEET UDIF 2K 6	PAGE 6 OF 9



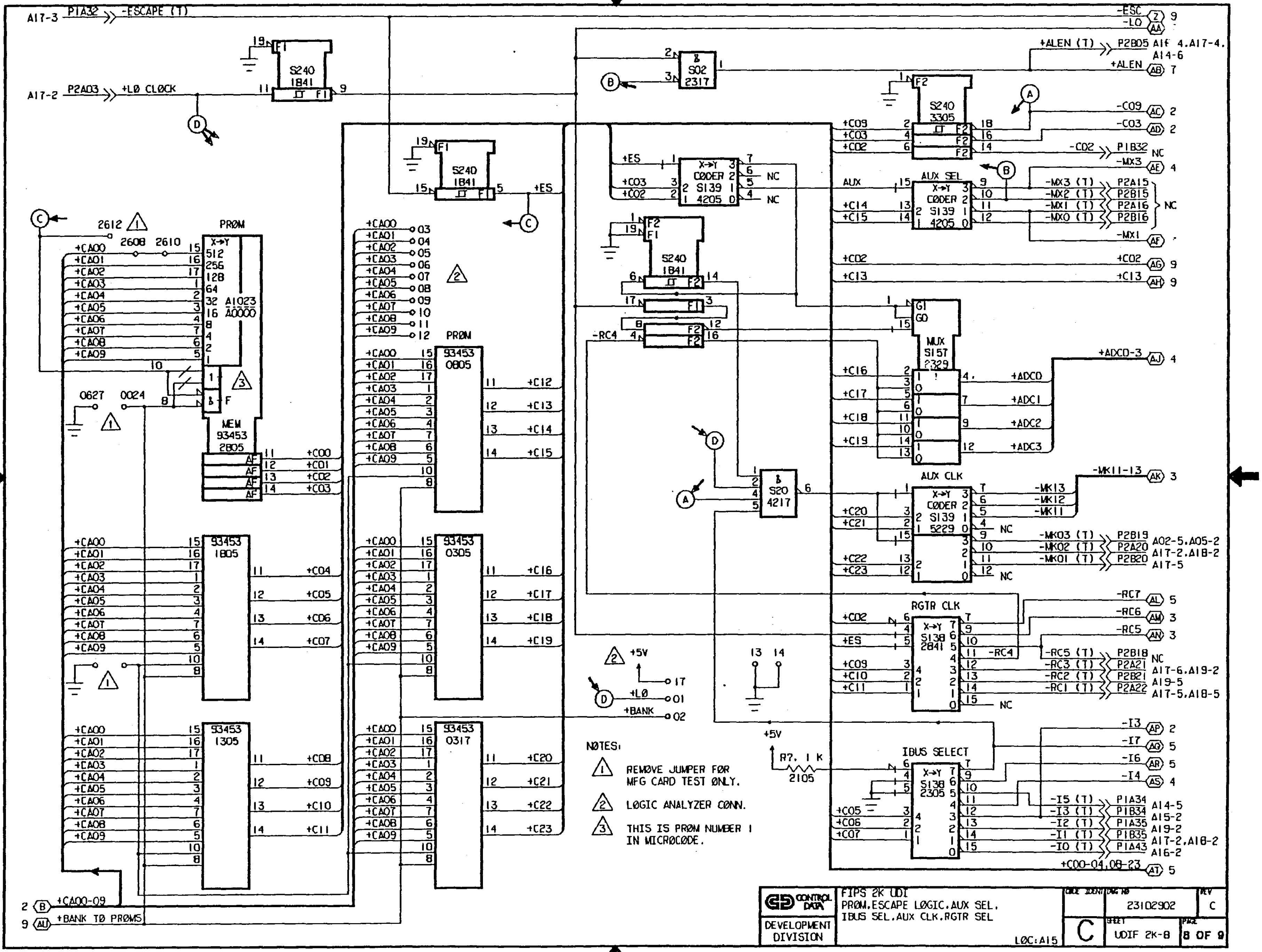
NOTES:

1. P2B32 AND P1A07 ARE TIED TOGETHER ON THE BACKPANEL.
2. REMOVE JUMPER FOR MFG CARD TEST ONLY.
3. CUT FOIL ONLY TO TROUBLESHOOT CONTROLWARE.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI
SET/CLR INTERRUPTS,
INTERRUPT RGTR, AUX CLOCK
LOC:A15

C
23102902
REV C
UDIF 2K 7
7 OF 9



NØTES:

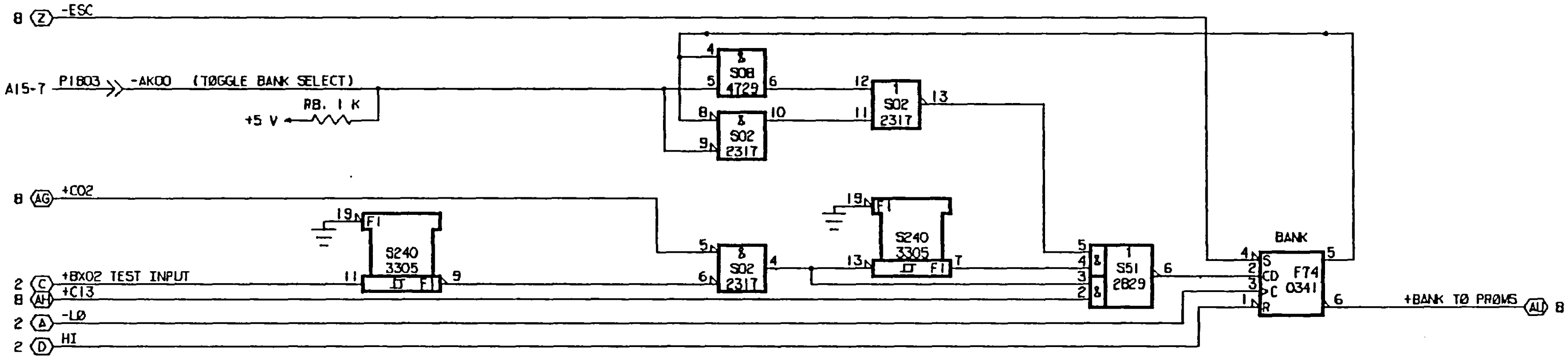
1. REMØVE JUMPER FØR MFG CARD TEST ØNLY.
2. LØGIC ANALYZER CØNN.
3. THIS IS PRØM NUMBER 1 IN MICRØCØDE.

CØNTRØL DATA
DEVELØPMENT DIVISIØN

FIPS 2K UDI
PRØM.ESCAPE LØGIC.AUX SEL.
IBUS SEL.AUX CLK.RGTR SEL

LØC:A15

CØDE IDENT	DWG NØ	REV
C	23102902	C
SHEET	UDIF 2K-8	PAGE 8 OF 9



CONTROL DATA

DEVELOPMENT DIVISION

FIPS 2K UDI

LOC:A15

CAGE IDENT	DWG NO	REV
	23102902	C

SIZE	SHEET	PAGE
C	UDIF 2K 9	9 OF 9

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60459180 AN

PAGE									REVISION RECORD					
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B	B	B	B	B	B	B	B	B	CA48239	ADDED COVER, RE-INTERSHEET	MES	9/16/86	NS	NS
B	B	B	B	B	B	B	B	C	CA48688	NEW PWA NUMBER	KMS	5/11/87	NS	NS
B	B	B	B	B	B	B	B	D	CA49315	NEW PWA NUMBER	KMS	3/21/88	KS	KS

NOTES:

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3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.

4. THE CHIP IDENTIFIERS ON PWA-22110342 WERE CHANGED TO 'F' TYPE CHIPS, UNLESS OTHERWISE NOTED. EXAMPLE - 'F74' ON PWA-22110342 IS 'S74' ON PWA-67327641.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	08/86
CHKD	N SAMPSON	08/86
ENGR	R T HENNING	08/86
MFG	B J REILAND	08/86
APVD	R T HENNING	08/86

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
FIPS 2K UDI

PWA-10284352
PWB-67046086

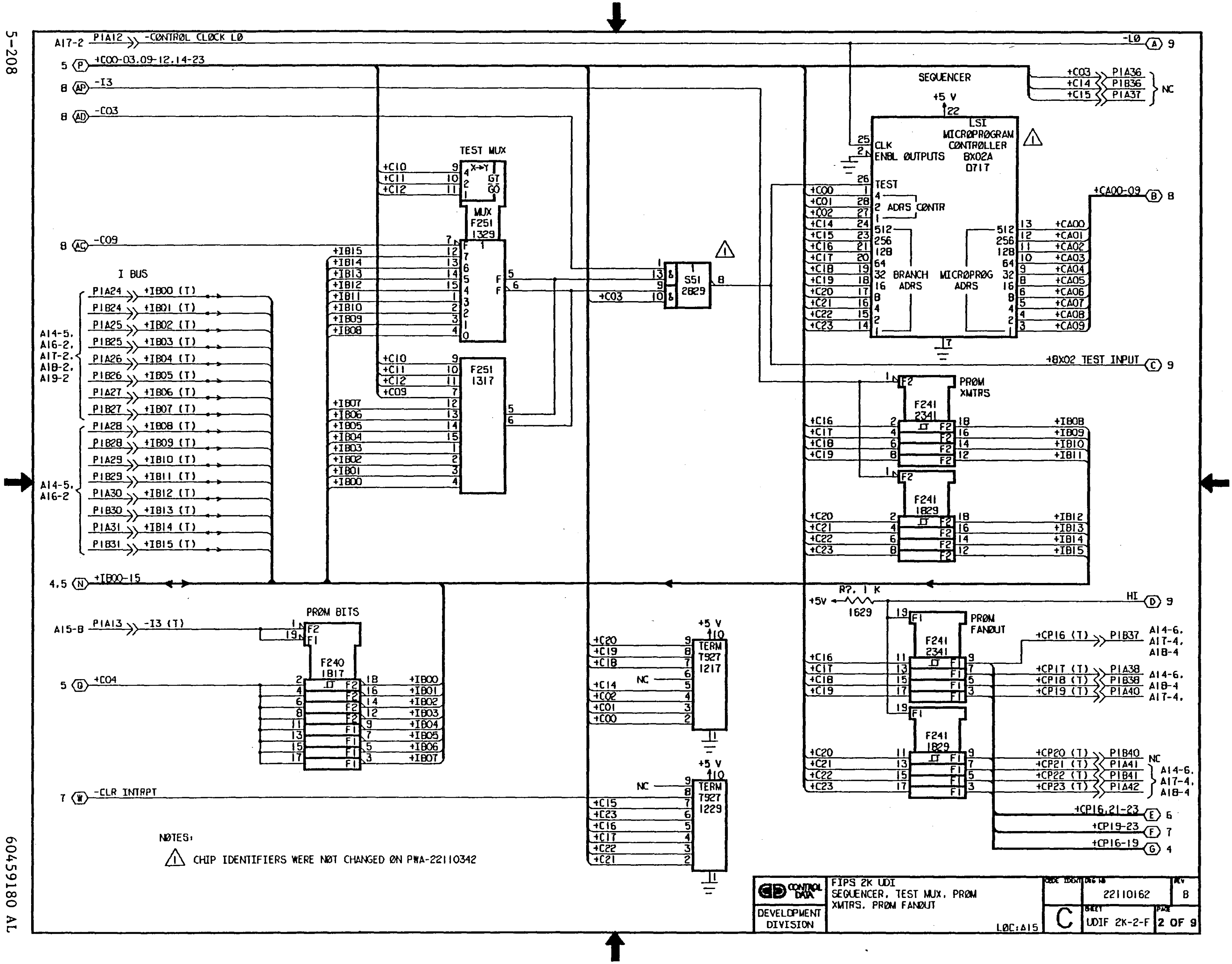
SIZE C
FSCM NO. 34010
DWG NO. 22110162

LOC: A15
SHEET UDIF 2K-1-F
PAGE 1 OF 9

CALMA

CSIZECOVER1

5-207



NOTES:

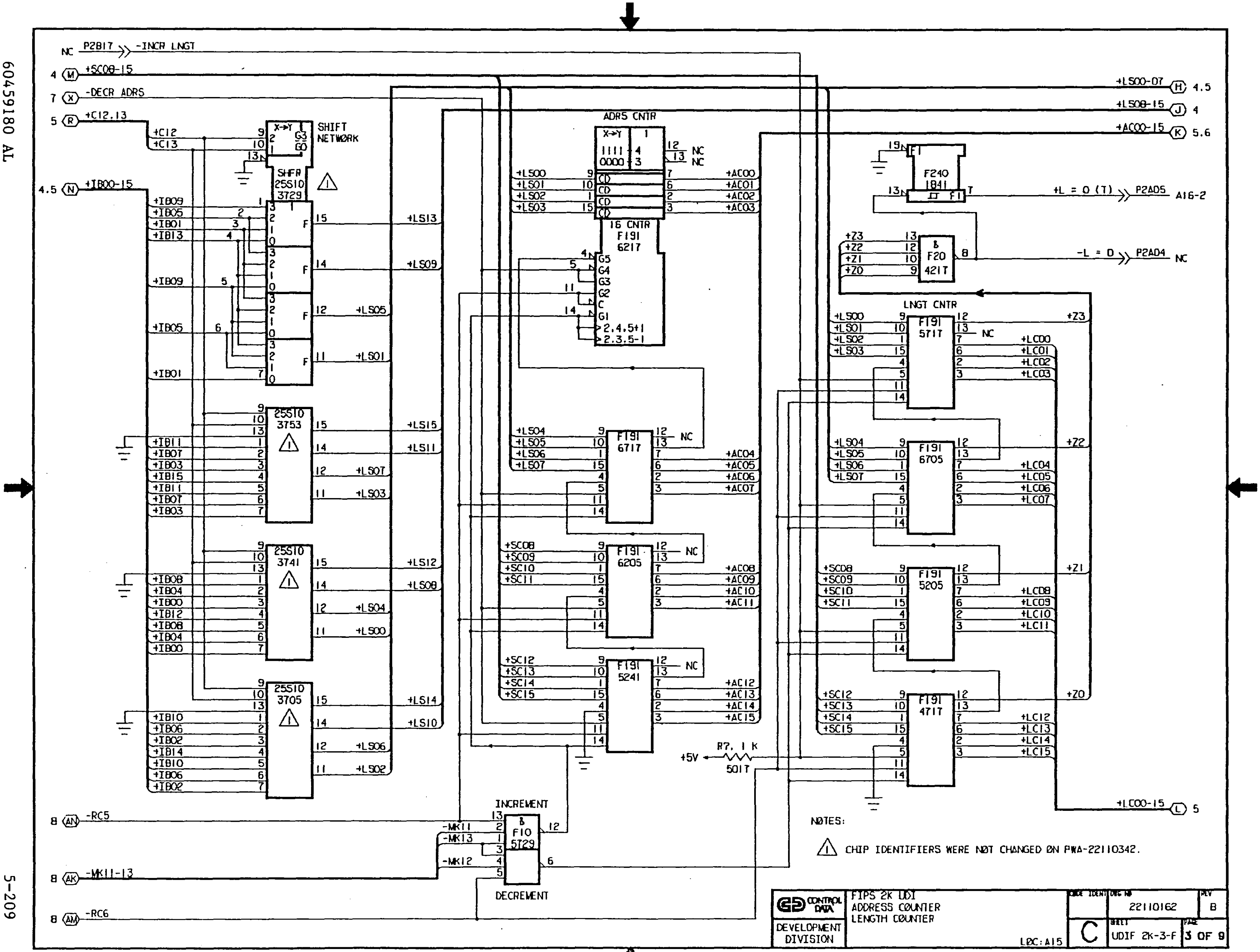
⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110342

CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI
SEQUENCER, TEST MUX, PROM XMTRS, PROM FANOUT

LOC:A15

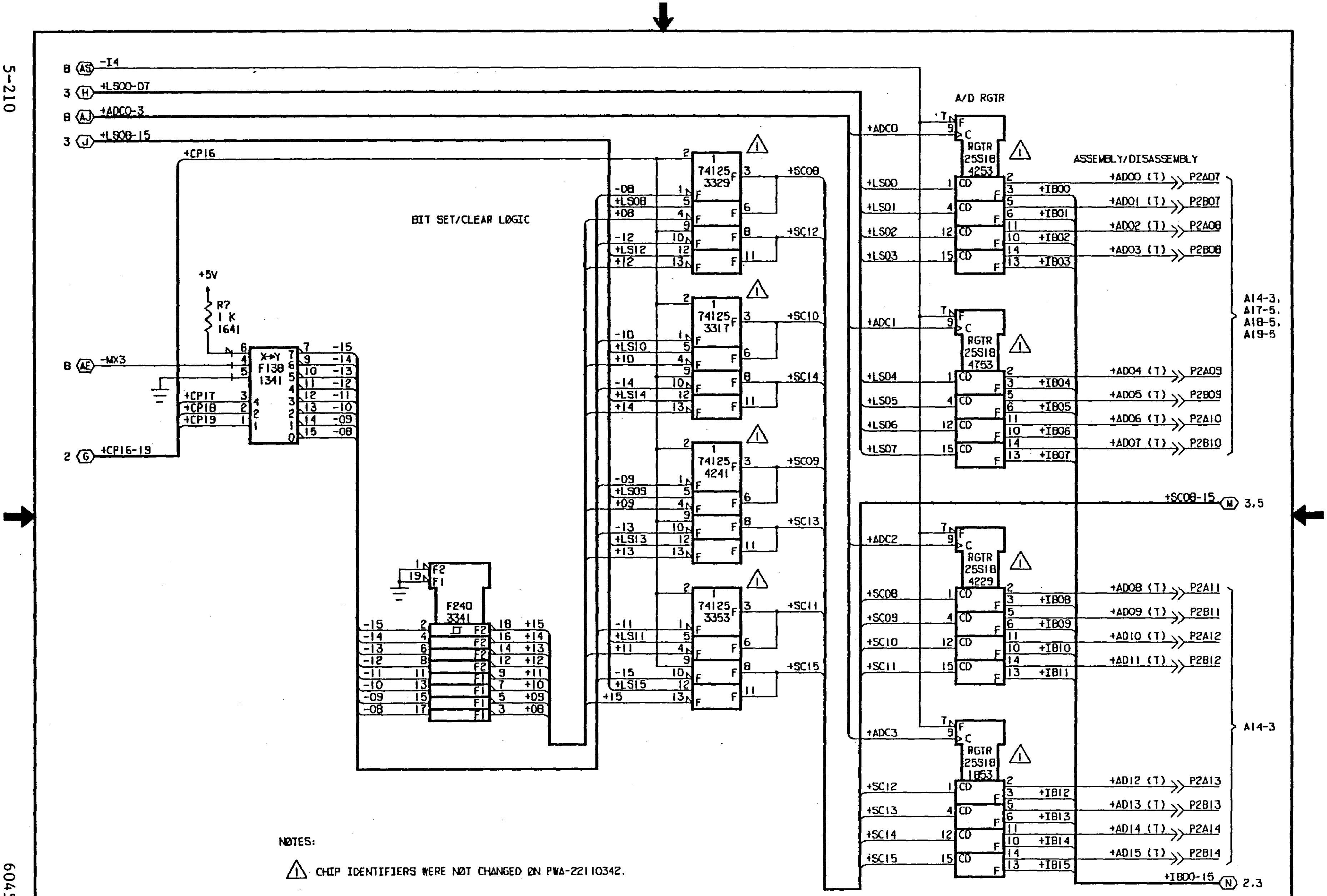
DWG NO 22110162 REV B
C
SHEET UDIF 2K-2-F PAGE 2 OF 9



NOTES:

⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110342.

CONTROL DATA DEVELOPMENT DIVISION	FIPS 2K UDI ADDRESS COUNTER LENGTH COUNTER LOC: A15	CODE IDENT	DWG NO 22110162	REV B
		C	SHEET UDIF 2K-3-F	PAGE 3 OF 9



NOTES:

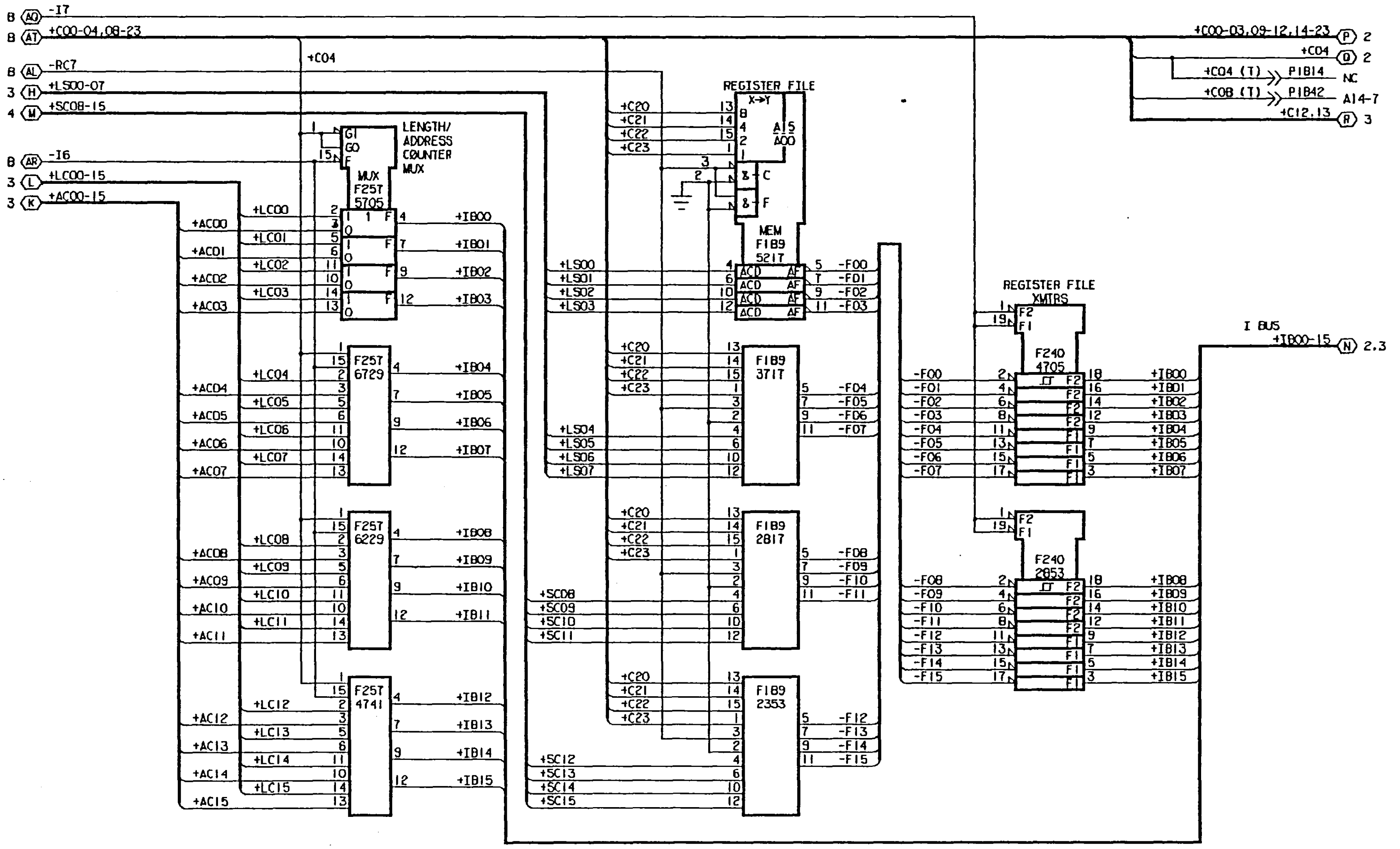
⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110342.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI
BIT SET/CLEAR, ASSEMBLY/
DISASSEMBLY (A/D) RGTR

LOC: A15

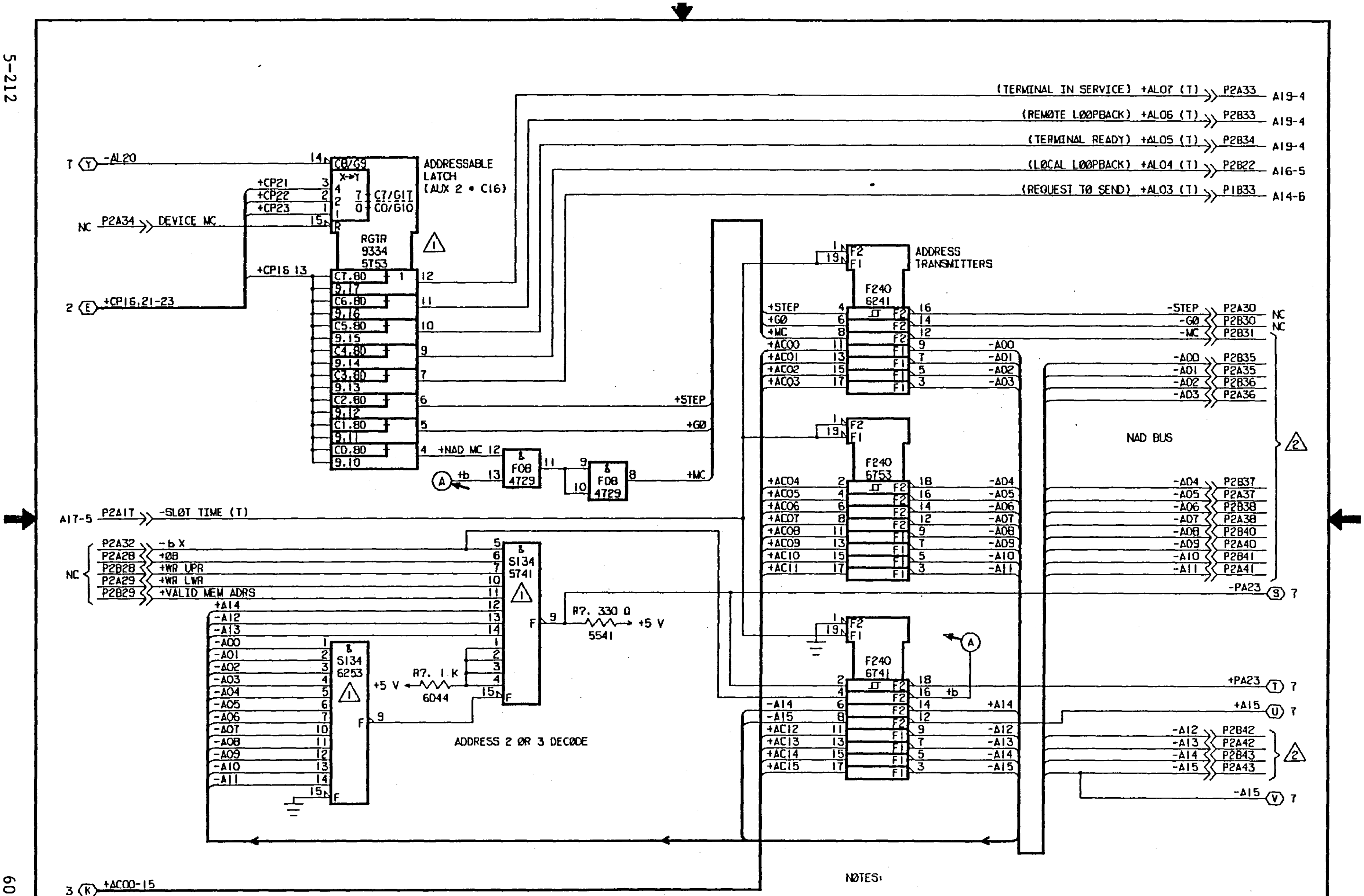
CODE IDENT	DWG NO	REV
C	22110162	B
	SHEET UDIF 2K-4-F	PAGE 4 OF 9


B (AQ) -I7
B (AT) +C00-04,08-23
B (AL) -RC7
3 (H) +LS00-07
4 (M) +SC08-15
B (AR) -I6
3 (L) +LC00-15
3 (K) +AC00-15
+C04
LENGTH/ ADDRESS COUNTER MUX
MUX F257 5705
F257 6729
F257 6229
F257 4741
G1 G0 F
+AC00 +AC01 +AC02 +AC03 +AC04 +AC05 +AC06 +AC07 +AC08 +AC09 +AC10 +AC11 +AC12 +AC13 +AC14 +AC15
+LC00 +LC01 +LC02 +LC03 +LC04 +LC05 +LC06 +LC07 +LC08 +LC09 +LC10 +LC11 +LC12 +LC13 +LC14 +LC15
+IB00 +IB01 +IB02 +IB03 +IB04 +IB05 +IB06 +IB07 +IB08 +IB09 +IB10 +IB11 +IB12 +IB13 +IB14 +IB15
REGISTER FILE
X→Y
A15 A00
MEM F189 5217
F189 3717
F189 2817
F189 2353
ACD AF
+C20 +C21 +C22 +C23
+LS00 +LS01 +LS02 +LS03 +LS04 +LS05 +LS06 +LS07
+SC08 +SC09 +SC10 +SC11 +SC12 +SC13 +SC14 +SC15
-F00 -F01 -F02 -F03 -F04 -F05 -F06 -F07 -F08 -F09 -F10 -F11 -F12 -F13 -F14 -F15
REGISTER FILE XMTRS
F240 4705
F240 2853
F2 F1
+C00-03,09-12,14-23 (P) 2
+C04 (D) 2
+C04 (T) P1B14 NC
+C08 (T) P1B42 A14-7
+C12,13 (R) 3
I BUS
+IB00-15 (N) 2,3

CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI
LENGTH/ADDRESS MUX, REGISTER FILE, REGISTER FILE XMTRS
LOC:A15

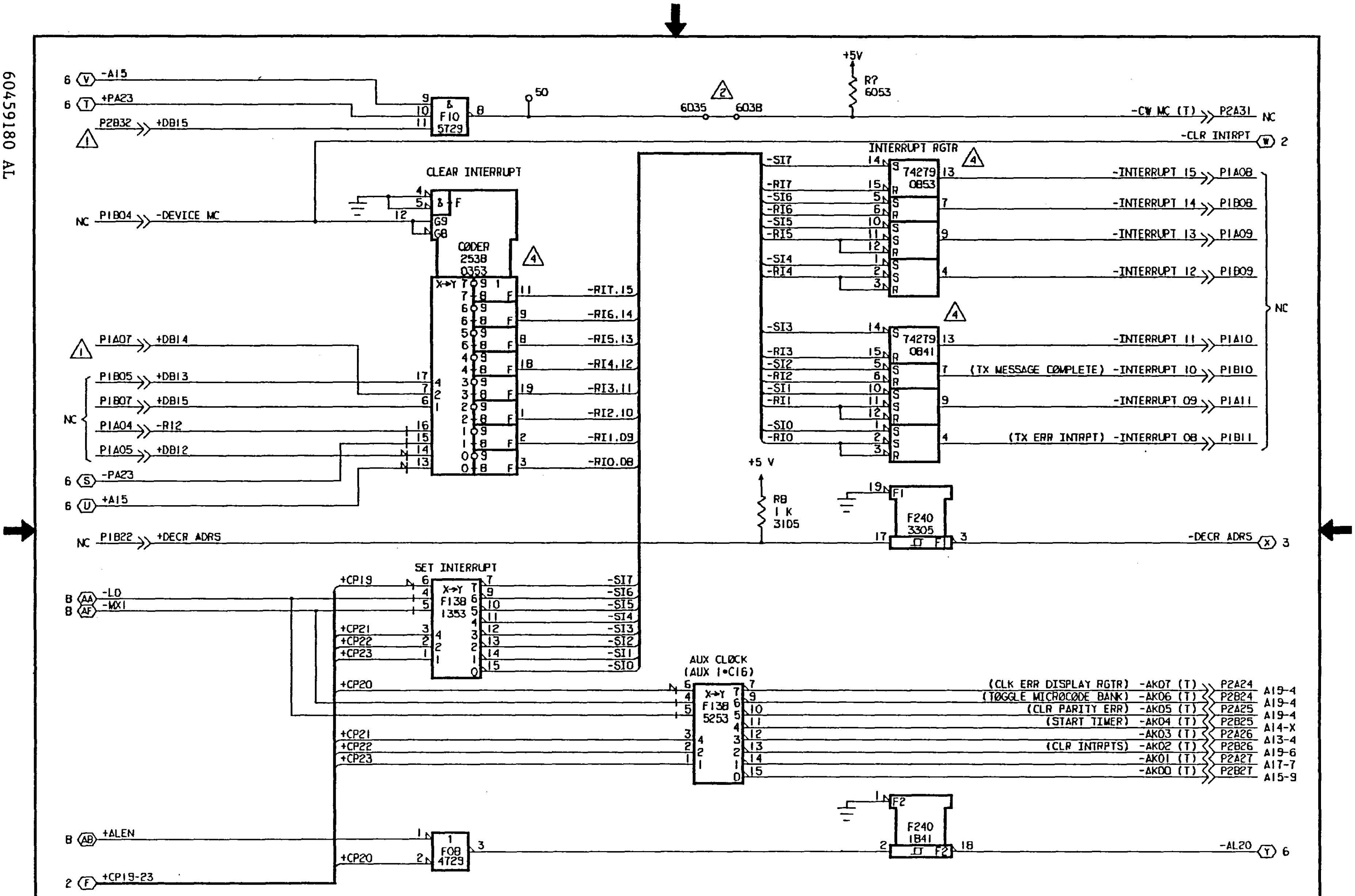
CODE IDENT	DWG NO	REV
C	22110162	B
	SHEET UDIF 2K-5-F	PAGE 5 OF 8



N0TES:

1. CHIP IDENTIFIERS WERE N0T CHANGED 0N PWA-22110342.
2. C0NNECTI0NS ARE T0 BACKPANEL BUSES.

CONTROL DATA	FIPS 2K UDI ADDRESSABLE LATCH, ADDR 2/3 DEC0DE, ADDRESS TRANSMITTERS	CODE IDENT	DWG NO 22110162	REV B
DEVELOPMENT DIVISION	L0C:A15	C	SHEET UDIF 2K-6-F	PAGE 6 OF 9



NØTES:

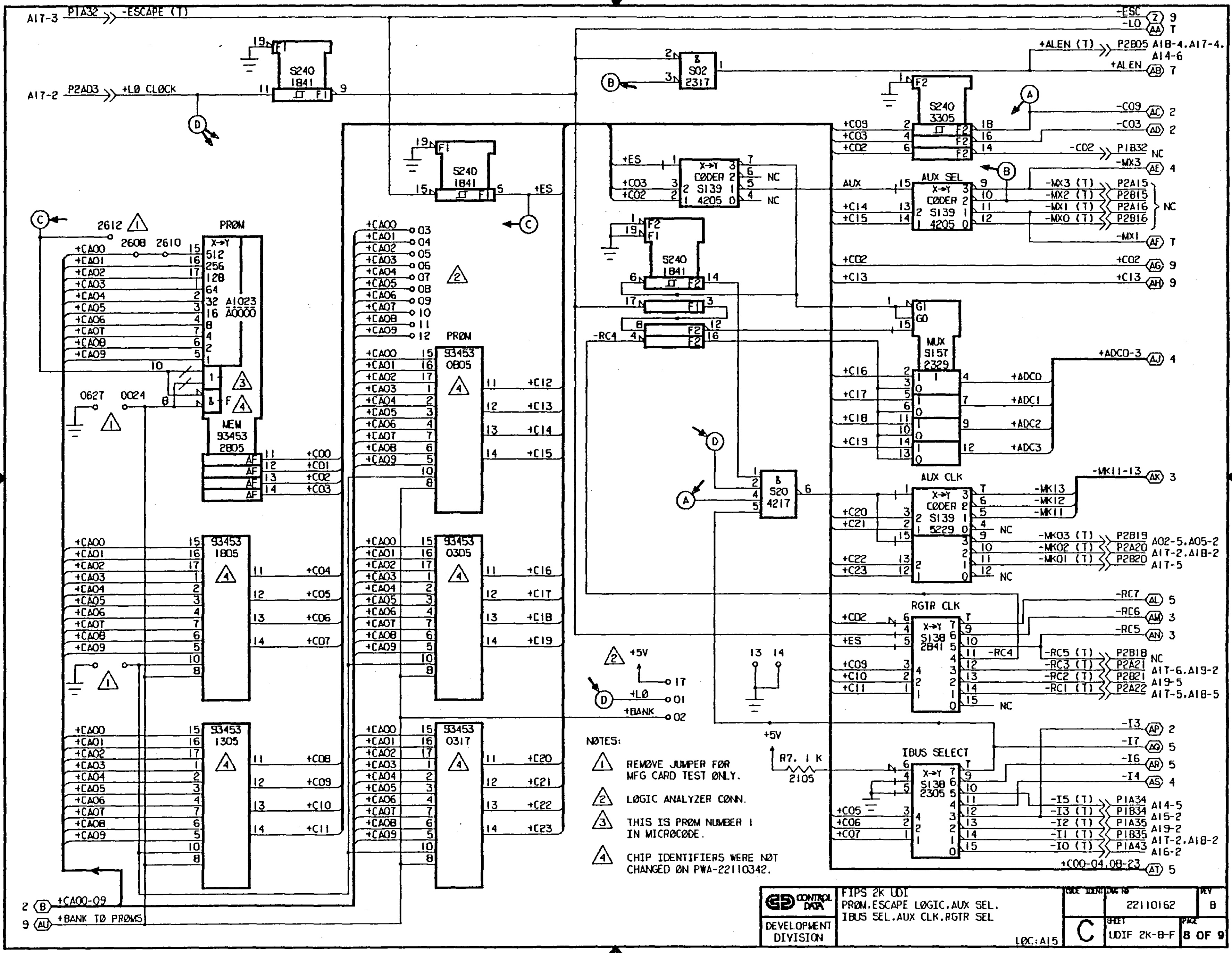
1. P2B32 AND P1A07 ARE TIED TØGETHER ØN THE BACKPANEL.
2. REMØVE JUMPER FØR MFG CARD TEST ØNLY.
3. CUT FØIL ØNLY TØ TRØUBLESHØØT CØNTRØLWARE.
4. CHIP IDENTIFIERS WERE NØT CHANGED ØN PWA-22110342.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI
SET/CLR INTERRUPTS.
INTERRUPT RGTR. AUX CLØCK

LØC:A15

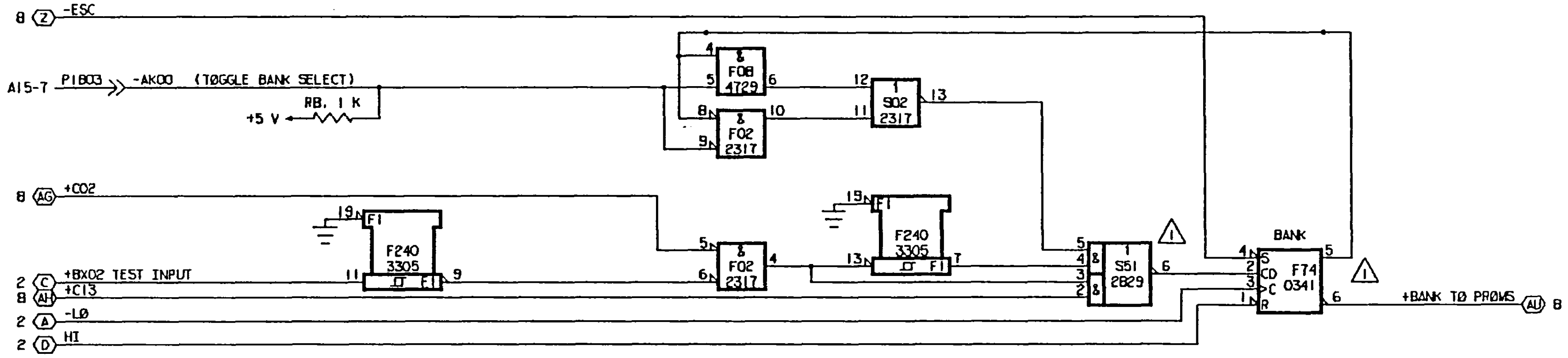
CODE IDENT	DWG NO	REV
C	22110162	B
	SHEET UDIF 2K-7-F	PAGE 7 OF 9



N0TES:

1. REM0VE JUMPER F0R MFG CARD TEST 0NLY.
2. L0GIC ANALYZER C0NN.
3. THIS IS PR0M NUMBER 1 IN MICR0C0DE.
4. CHIP IDENTIFIERS WERE N0T CHANGED 0N PWA-22110342.

CONTROL DATA DEVELOPMENT DIVISION	FIPS 2k UDI PR0M, ESCAPE L0GIC, AUX SEL, IBUS SEL, AUX CLK, RGTR SEL L0C: A15	CODE IDENT	DWG NO 22110162	REV B
		C	SHEET UDIF 2K-8-F	PAGE 8 OF 9



NOTES:

△1 CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22110342.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS 2K UDI

LOC:A15

CODE IDENT
C

DWG NO
22110162

REV
B

SHEET
UDIF 2K-9-F

PAGE
9 OF 9

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PAGE					REVISION RECORD					
5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A		CLASS A RELEASED	MES	12/84	NZ	LBU
A	A	A	A	B	CA46824	SEE C.O.	LH	8/85	NZ	LBU
C	A	C	A	C	CA47357	SEE C.O.	MES	10/85	NZ	NZ
D	D	D	D	D	CA47702	INACTIVE. FOR SERVICE USE ONLY SUPERSEDED BY PWB-22179488	MES	8/21/86	NS	NS
E	E	E	E	E	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/25/87	NS	NS
E	F	E	E	F	CA48535	SEE C.O.	MES	2/9/87	NS	NS
G	F	E	E	G	CA49254	SEE C.O.	MES	12/9/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M.E. SCHMIDT	12/84
CHKD	N. ZAK	12/84
ENGR	L.B. ULFIG	02/85
MFG	B.J. REILAND	02/85
APVD	L.B. ULFIG	02/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
STREAM LOGIC

PWA-10285714 PWB-23105178

SIZE C FSCM NO. 34010 DWG NO. 23102912

LOC: A16 SHEET STREAM 1 R PAGE 1 OF 5

CALMA

CSIZECOVER1

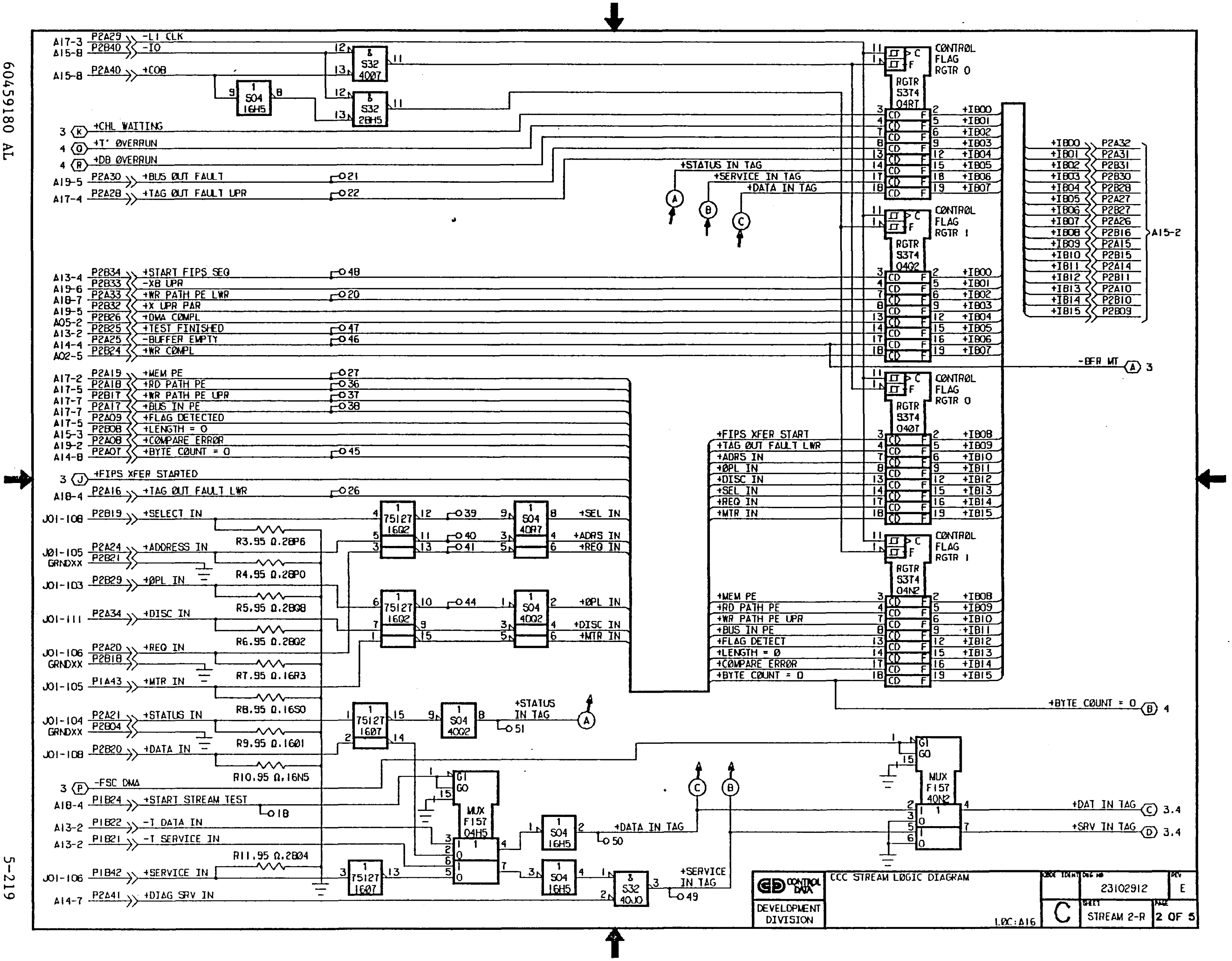
STREAM LOGIC - (A16-2)

CONTROL FLAG REGISTERS

Various status and control signals and tag lines are clocked into control flag registers 0 and 1 by the L1 Clk signal from the data bus. When bit C08 from the UDI (A15-8) is set, control flag register 1 is enabled. If this bit is not set, control flag register 0 is enabled. The control flag register signals are sent to the I bus.

TAG LINE CIRCUITS

These circuits receive signals on the tag lines from the external FIPS device. The tag lines control information on the bus-in lines (A19-2).



CONTROL DATA

DEVELOPMENT DIVISION

CCC STREAM LOGIC DIAGRAM

LOC:A16

CODE IDENT

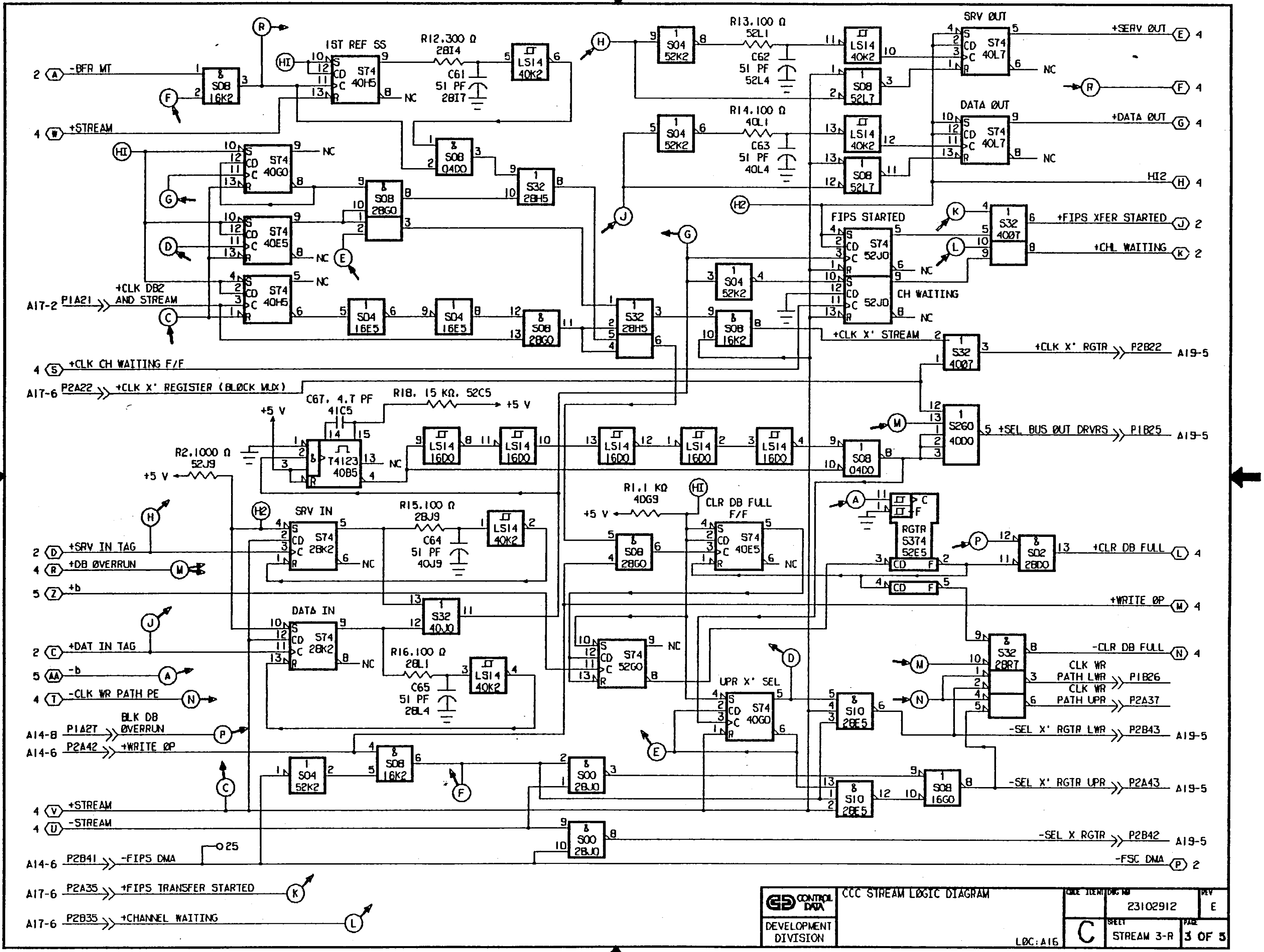
C

DWG NO 23102912

REV E

SHEET STREAM 2-R

PAGE 2 OF 5



CONTROL DATA

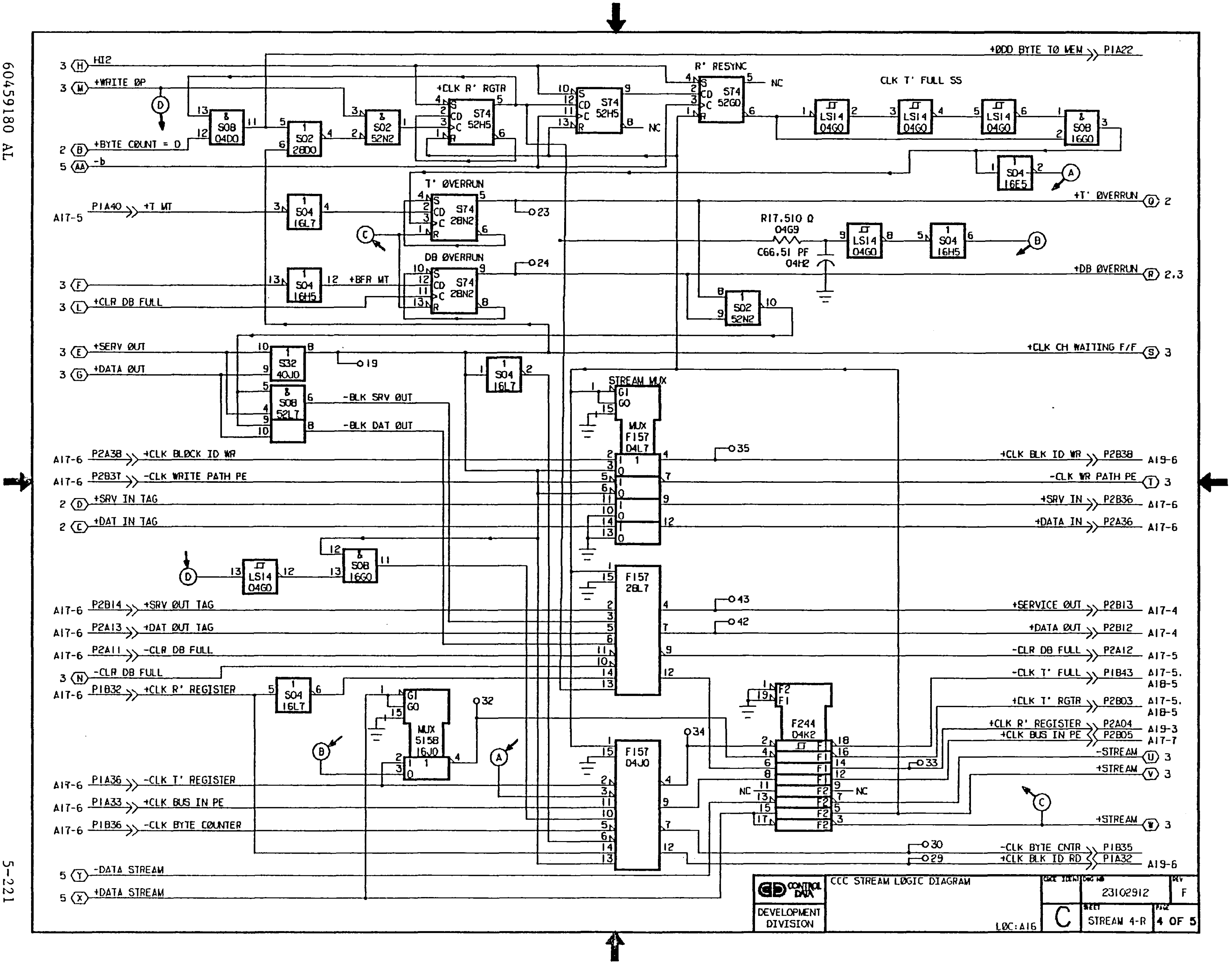
DEVELOPMENT DIVISION

CCC STREAM LOGIC DIAGRAM

LOC: A16

CODE IDENT	DWG NO	REV
	23102912	E

SIZE	SHEET	PAGE
C	STREAM 3-R	3 OF 5



CONTROL DATA

DEVELOPMENT DIVISION

CCC STREAM LØGIC DIAGRAM

LØC:A16

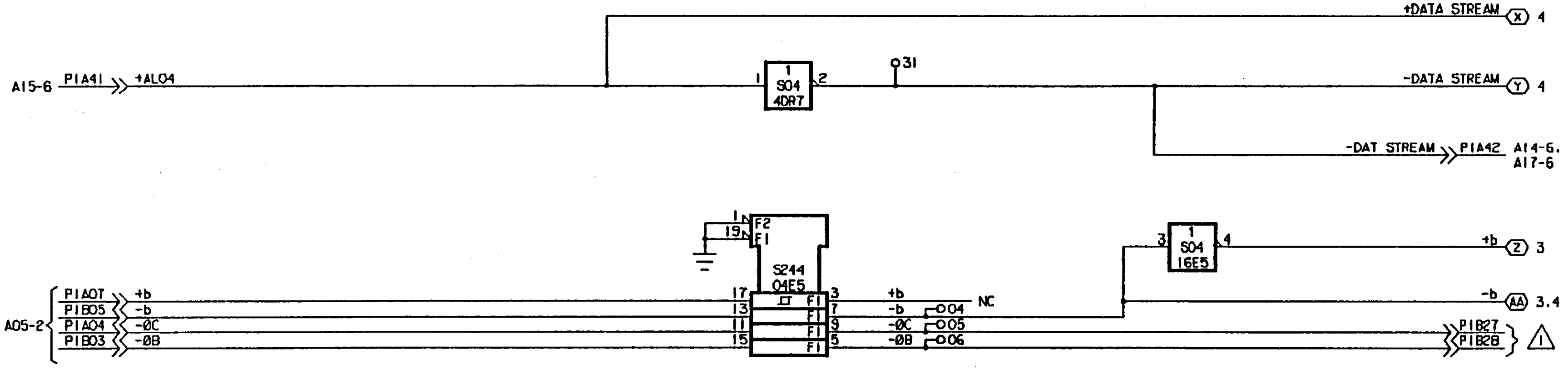
23102912

F

C

STREAM 4-R

4 OF 5



NOTE:

1 NOT USED ON FR205. CONNECTED TO A21-2 ON FV720.

CONTROL DATA	CCC STREAM LOGIC DIAGRAM	CODE IDENT	DWG NO 23102912	REV G
DEVELOPMENT DIVISION	LOC: A16	C	SHEET STREAM 5-R	PAGE 5 OF 5

CALMA

PAGE					REVISION RECORD					
5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A		CLASS A RELEASED	MES	12/84	NZ	LBU
A	A	A	A	B	CA46824	SEE C.O.	LH	8/85	NZ	LBU
C	A	C	A	C	CA47357	SEE C.O.	MES	10/85	NZ	NZ
D	D	D	D	D	CA47702	INACTIVE. FOR SERVICE USE ONLY SUPERSEDED BY PWB-22179488	MES	8/21/86	NS	NS
E	E	E	E	E	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/25/87	NS	NS
E	F	E	E	F	CA48535	SEE C.O.	MES	2/9/87	NS	NS
G	F	E	E	G	CA49254	SEE C.O.	MES	12/9/87	NS	NS

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DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M.E. SCHMIDT	12/84
CHKD	N. ZAK	12/84
ENGR	L.B. ULFIG	02/85
MFG	B.J. REILAND	02/85
APVD	L.B. ULFIG	02/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
STREAM LOGIC

PWA-53595830
PWB-23105178

SIZE C
FSCM NO. 34010
DWG NO. 23102912
LOC: A16
SHEET STREAM 1 R
PAGE 1 OF 5

CALMA

CSIZECOVER1

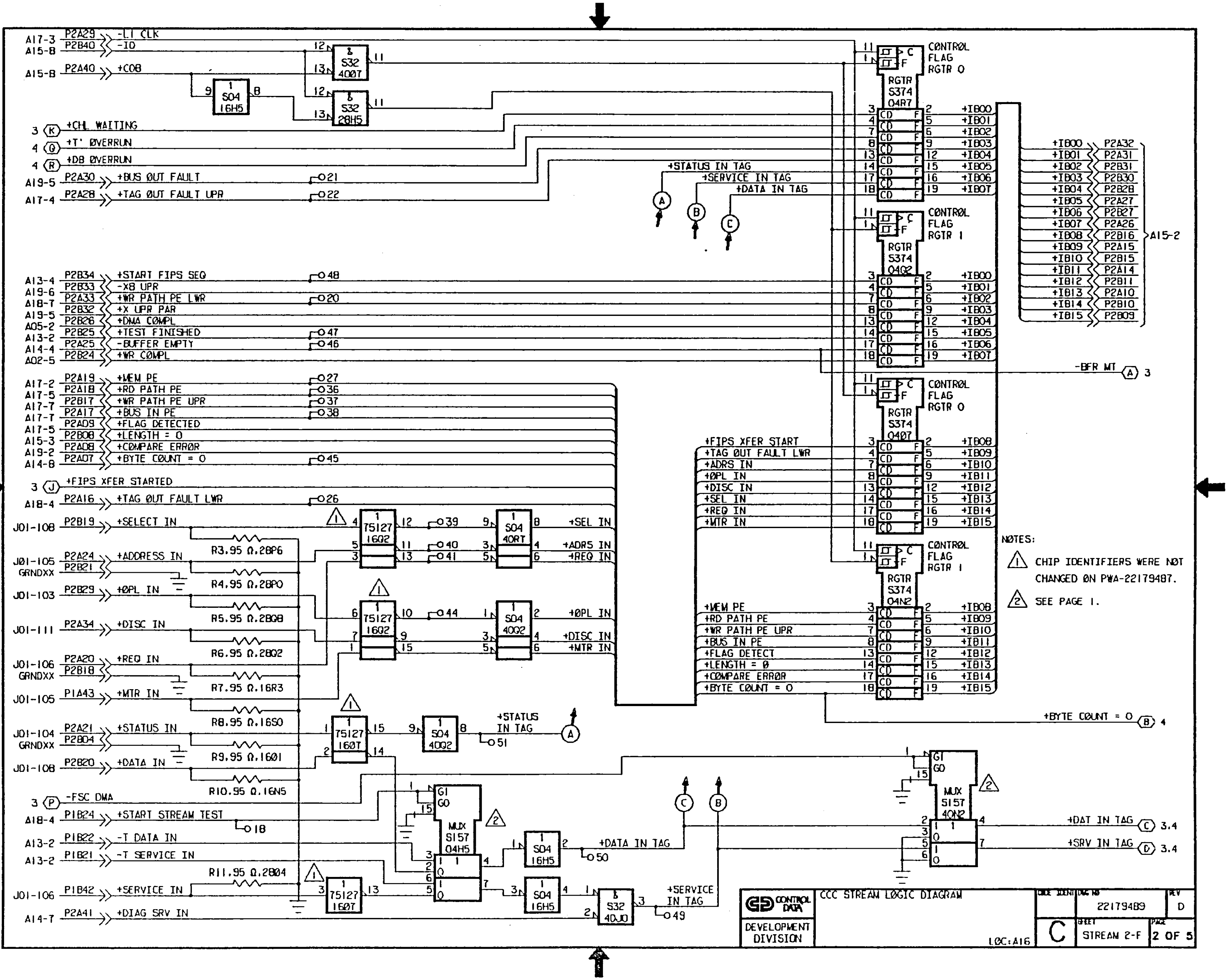
STREAM LOGIC - (A16-2)

CONTROL FLAG REGISTERS

Various status and control signals and tag lines are clocked into control flag registers 0 and 1 by the L1 Clk signal from the data bus. When bit C08 from the UDI (A15-8) is set, control flag register 1 is enabled. If this bit is not set, control flag register 0 is enabled. The control flag register signals are sent to the I bus.

TAG LINE CIRCUITS

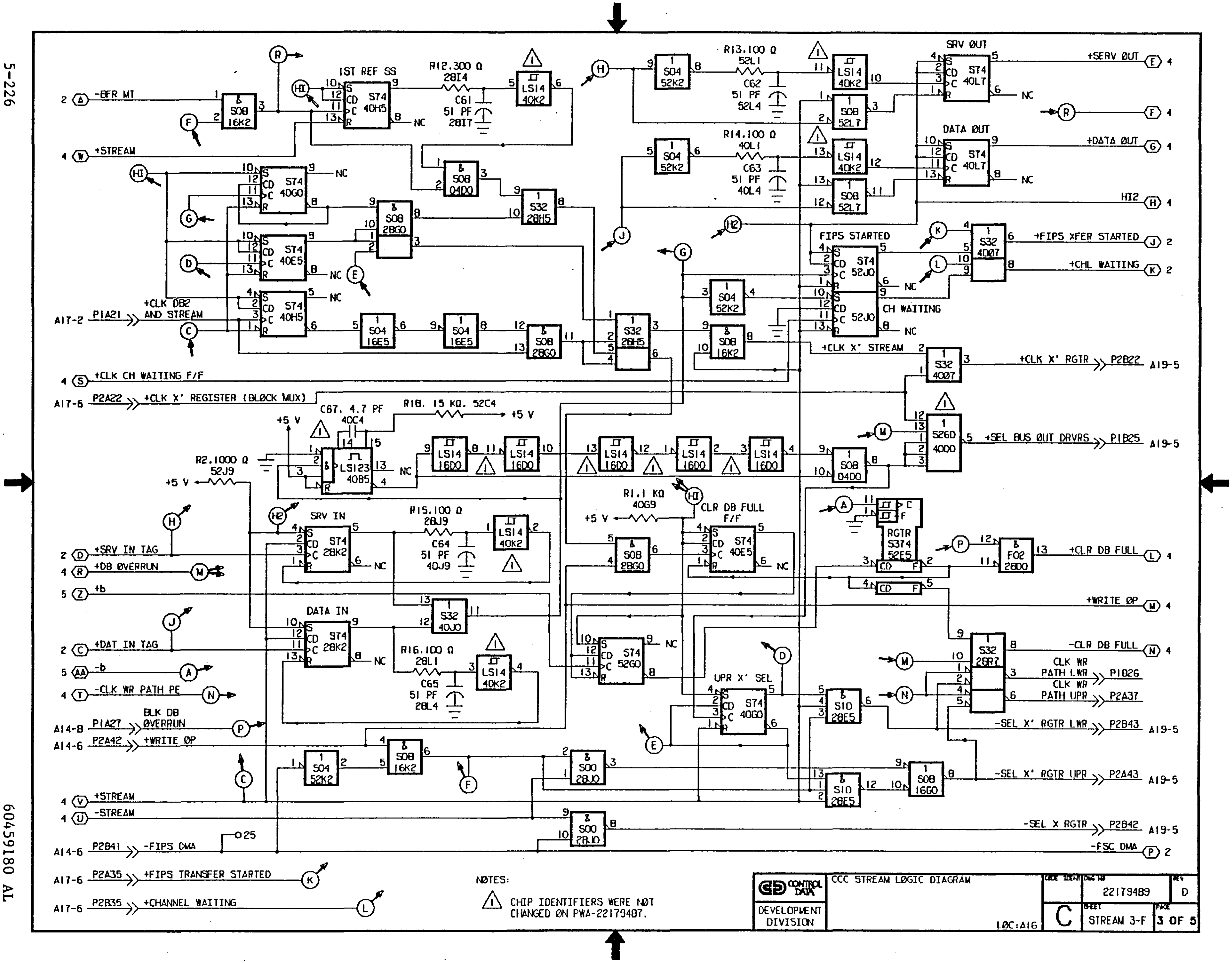
These circuits receive signals on the tag lines from the external FIPS device. The tag lines control information on the bus-in lines (A19-2).



NØTES:

1. CHIP IDENTIFIERS WERE NØT CHANGED ØN PWA-22179487.
2. SEE PAGE 1.

CONTROL DATA DEVELOPMENT DIVISION	CCC STREAM LØGIC DIAGRAM LØC:A16	C	DWG NO 22179489	REV D
			SHEET STREAM 2-F	PAGE 2 OF 5



NOTES:

⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22179487.

CONTROL DATA
DEVELOPMENT DIVISION

CCC STREAM LOGIC DIAGRAM

LOC:A16

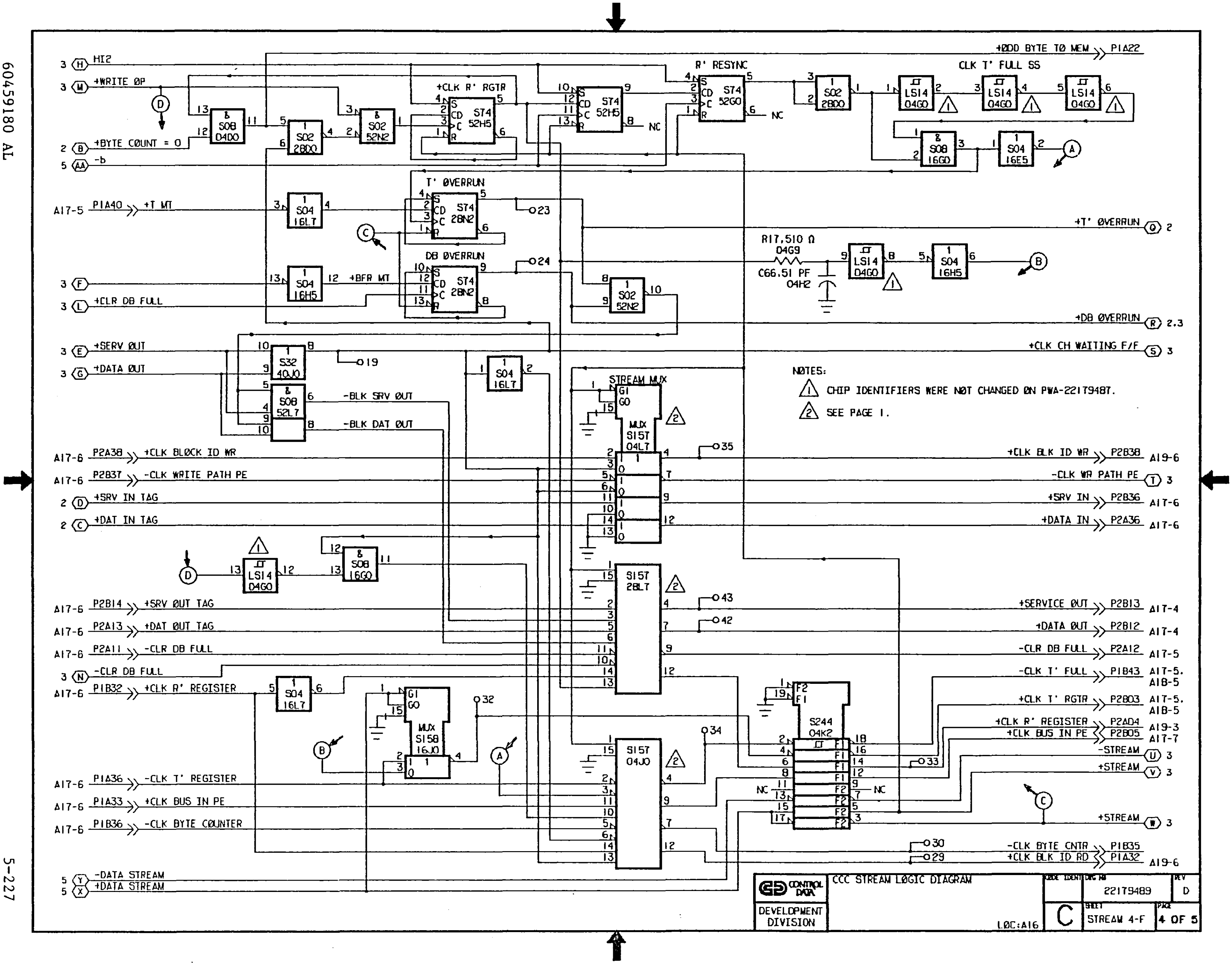
C

22179489

D

STREAM 3-F

3 OF 5



NOTES:

1. CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-22179487.
2. SEE PAGE 1.

CONTROL DATA DEVELOPMENT DIVISION

CCC STREAM LOGIC DIAGRAM

LOC:A16

CODE IDENT

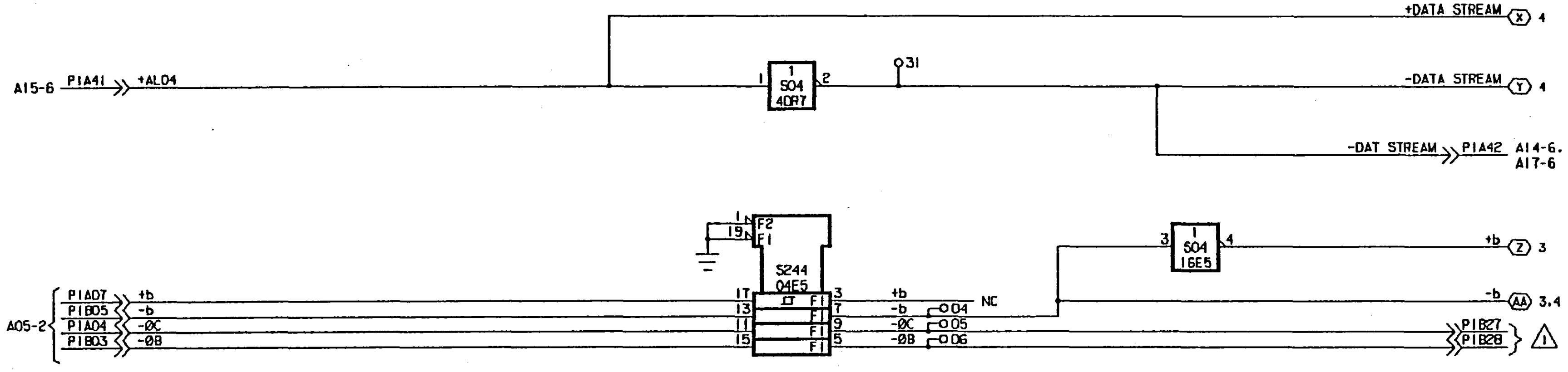
DWG NO 22179489

REV D

C

SHEET STREAM 4-F

PAGE 4 OF 5



NOTE:

1 NOT USED ON FR205. CONNECTED TO A21-2 ON FV720.

CONTROL DATA

DEVELOPMENT DIVISION

CCC STREAM LOGIC DIAGRAM

LOC:A16

CODE IDENT

C

DWG NO 221T9489

REV E

SHEET STREAM 5-F

PAGE 5 OF 5

PAGE							REVISION RECORD					
7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	LBU
A	A	A	B	A	A	B	CA46164	SEE C.O.	MES	04/85	NZ	LBU
A	A	C	C	A	A	C	CA47300	SEE C.O.	MES	10/85	NZ	NZ
D	D	D	D	D	D	D	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/26/87	NS	NS

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	L.B. ULFIG	04/85
MFG	B.J. REILAND	04/85
APVD	L.B. ULFIG	04/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
FIPS I/F 3

PWA-53590793
PWB-24670928

SIZE C
FSCM NO. 34010
DWG NO. 23102909

LOC: AIT
SHEET IF III I
PAGE 1 OF 7

FIPS INTERFACE - III (A17-2)

DATA BUS DRIVERS

During a coupler read operation, the upper 8-bit byte (bits T1 through T8) from the T register (A17-5) is transferred from the drivers to the data bus on the bidirectional data lines. The 8-bit byte is then written into memory (A10-5).

DATA BUS RECEIVERS

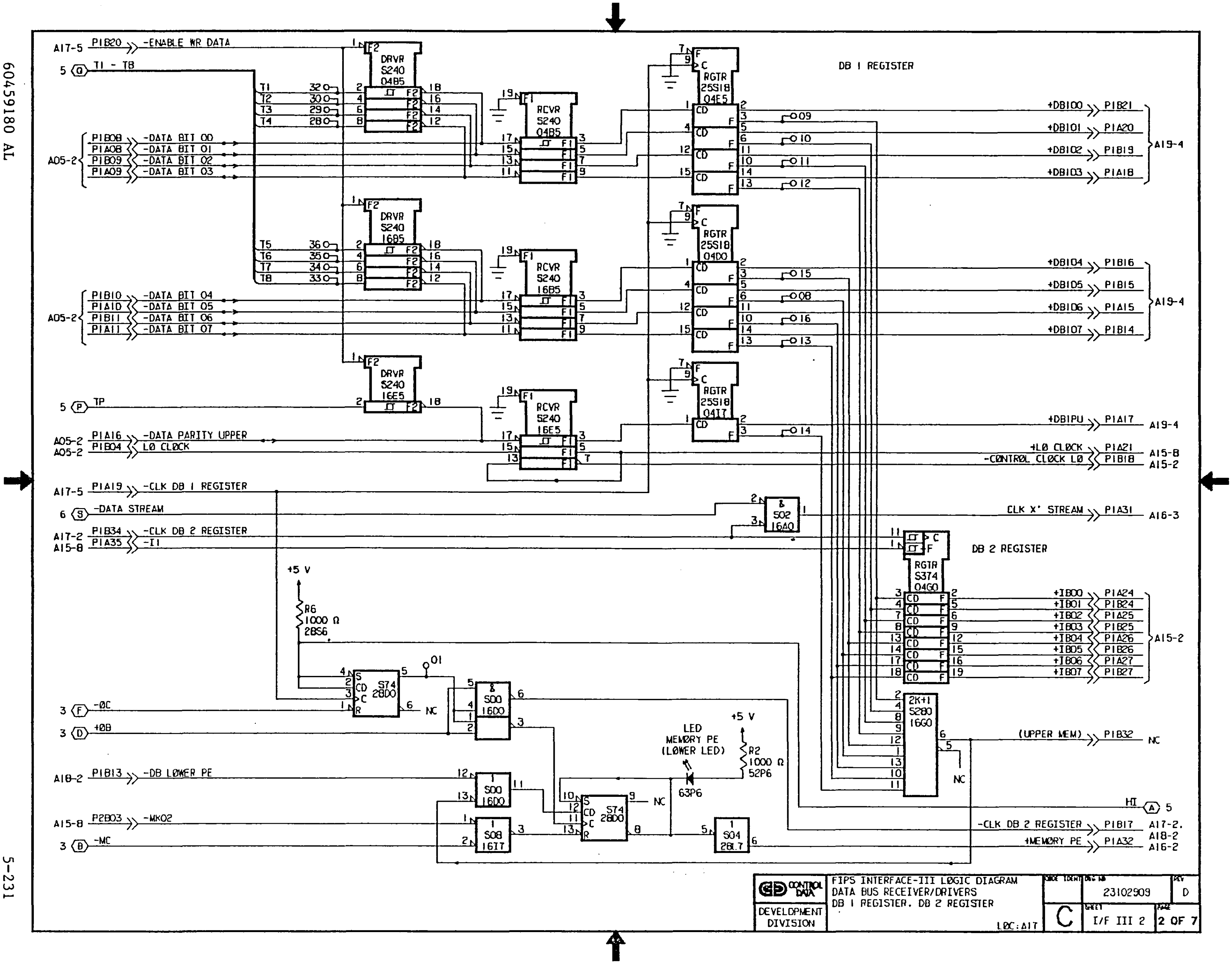
During a coupler write operation, the upper 8-bit byte (bits 00 through 07) is transferred from the data bus to the receivers on the same bidirectional lines used by the data bus drivers. The data bus receivers then send the 8-bit byte to the DB1 register.

DATA BUS REGISTERS (DB1, DB2)

The upper data bus byte from the data bus receivers is clocked into the DB1 register by the Clk DB1 Register signal from the memory control circuit (A17-5). This signal is also used to generate the Clk DB2 Register signal (A17-2) that clocks the upper data byte from the DB1 register to the multiplexer (A19-4) and into the DB2 register to the I bus as bits IB00 through IB07.

DATA BUS PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the upper data bus byte and associated parity bit. The memory parity error LED indicator is not used.



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
DATA BUS RECEIVER/DRIVERS
DB 1 REGISTER. DB 2 REGISTER

LØC: A17

DWG NO 23102909 REV D

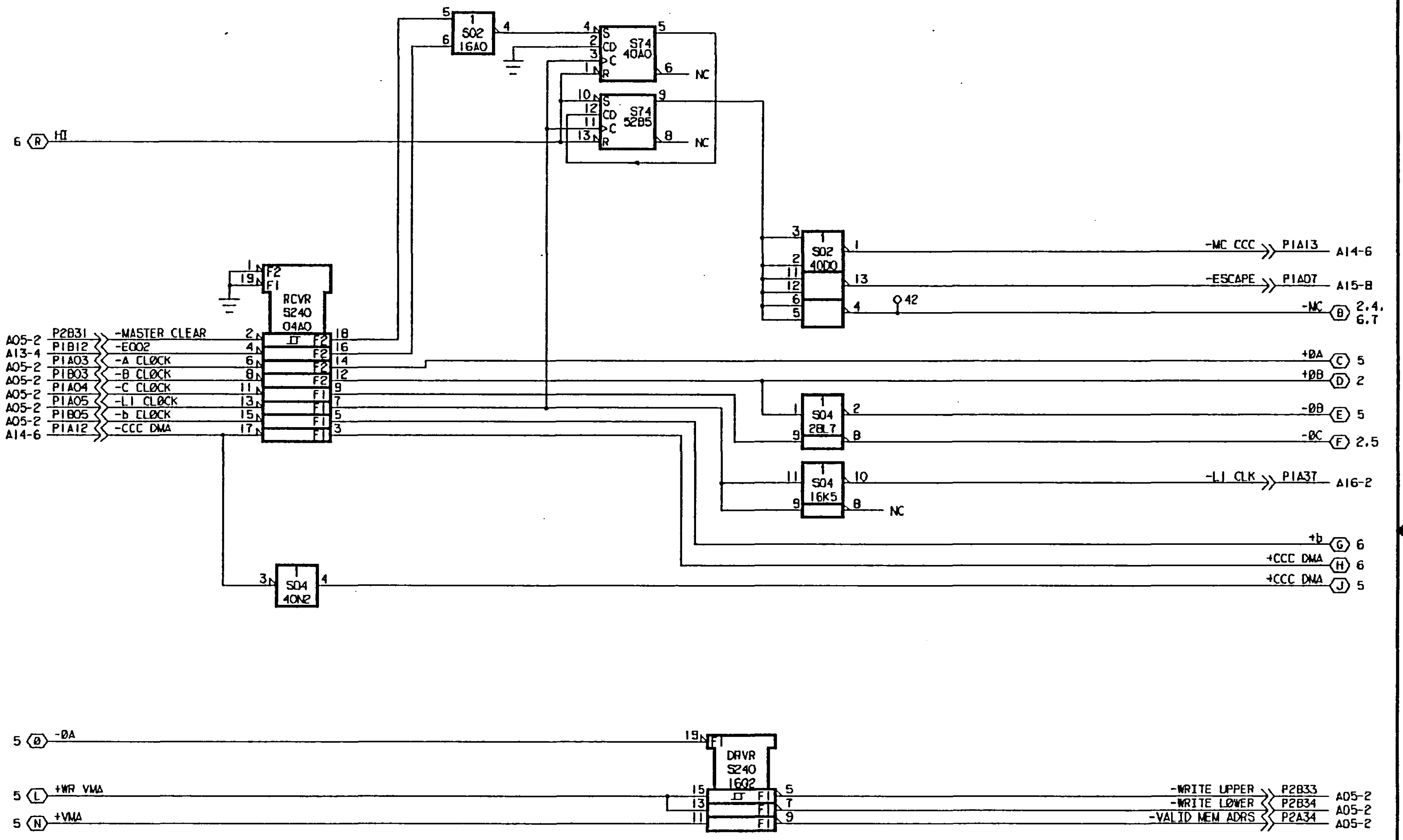
C

SHEET I/F III 2 PAGE 2 OF 7

FIPS INTERFACE - III (A17-3)

DATA BUS RECEIVERS/DRIVERS

Various clocks and signals including data bus access time clocks for the FIPS interface, processor, and CYBER interface (A, B, and C clocks) and master clear are received from the data bus or transmitted to the data bus via the data bus receivers/drivers.



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
DATA BUS RECEIVERS/DRIVERS

LOC:AIT

CODE IDENT

C

DWG NO 23102909

REV D

SHEET I/F III 3

PAGE 3 OF 7

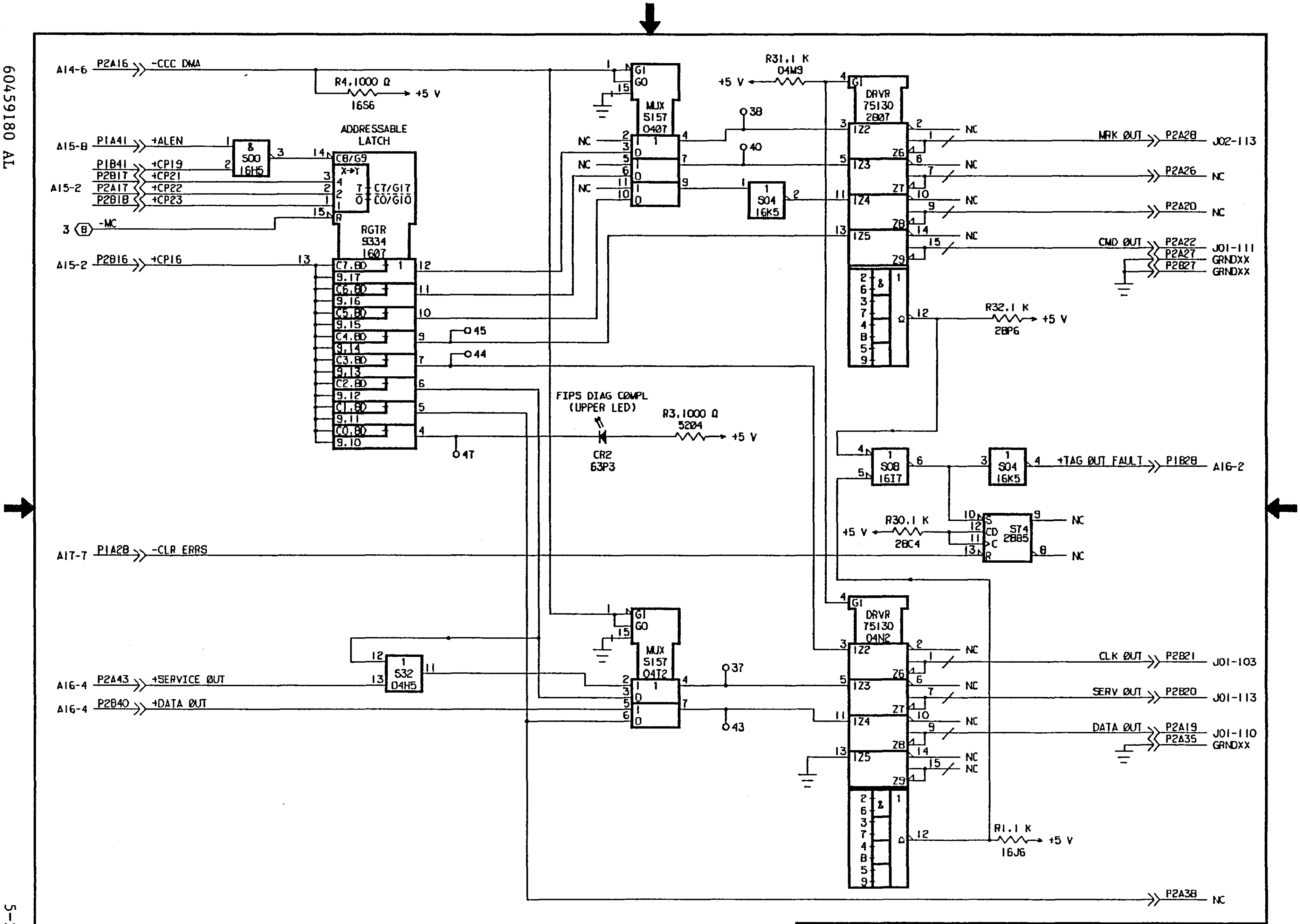
FIPS INTERFACE - III (A17-4)

ADDRESSABLE LATCH REGISTER

The outputs of the addressable latch register are selected by microcode bits CP19, CP21, CP22, and CP23 from the FIPS interface UDI sequencer (A15-2). The register outputs are sent via the multiplexer circuits to the tag transmitters. The associated LED indicator (CR2) is not used and remains unlit.

TAG TRANSMITTERS

These circuits transmit signals on the tag lines to the external FIPS device. The tag lines control the information that is present on the bus-out lines (A19-5).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
TAG TRANSMITTERS

LOC:A1T

CAGE IDENT	DWG NO	REV
C	23102909	D
SHEET	I/F III 4	PAGE 4 OF 7

FIPS INTERFACE - III (A17-5)

T REGISTER

The upper 8-bit byte of assembly/disassembly information (bits AD00 through AD07) is clocked into the T register during a UDI read operation. The read data bits (T1 through T8) in the T register are then sent to the data bus drivers (A17-2) and to the parity generator.

T′ REGISTER

The upper 8-bit byte of data bus information (data in bits 00 through 07) is clocked into the T′ register during a DMA read operation. The read data bits (T1 through T8) are sent to the parity generator (A17-5) and to the data bus drivers (A17-2).

PARITY GENERATION

A parity bit is generated on the data from the T or T′ register. This parity bit (TP) is sent to the data bus driver (A17-2) along with the read data bits (T1 through T8). The parity generator also sends a parity bit to the parity check circuit (A17-5).

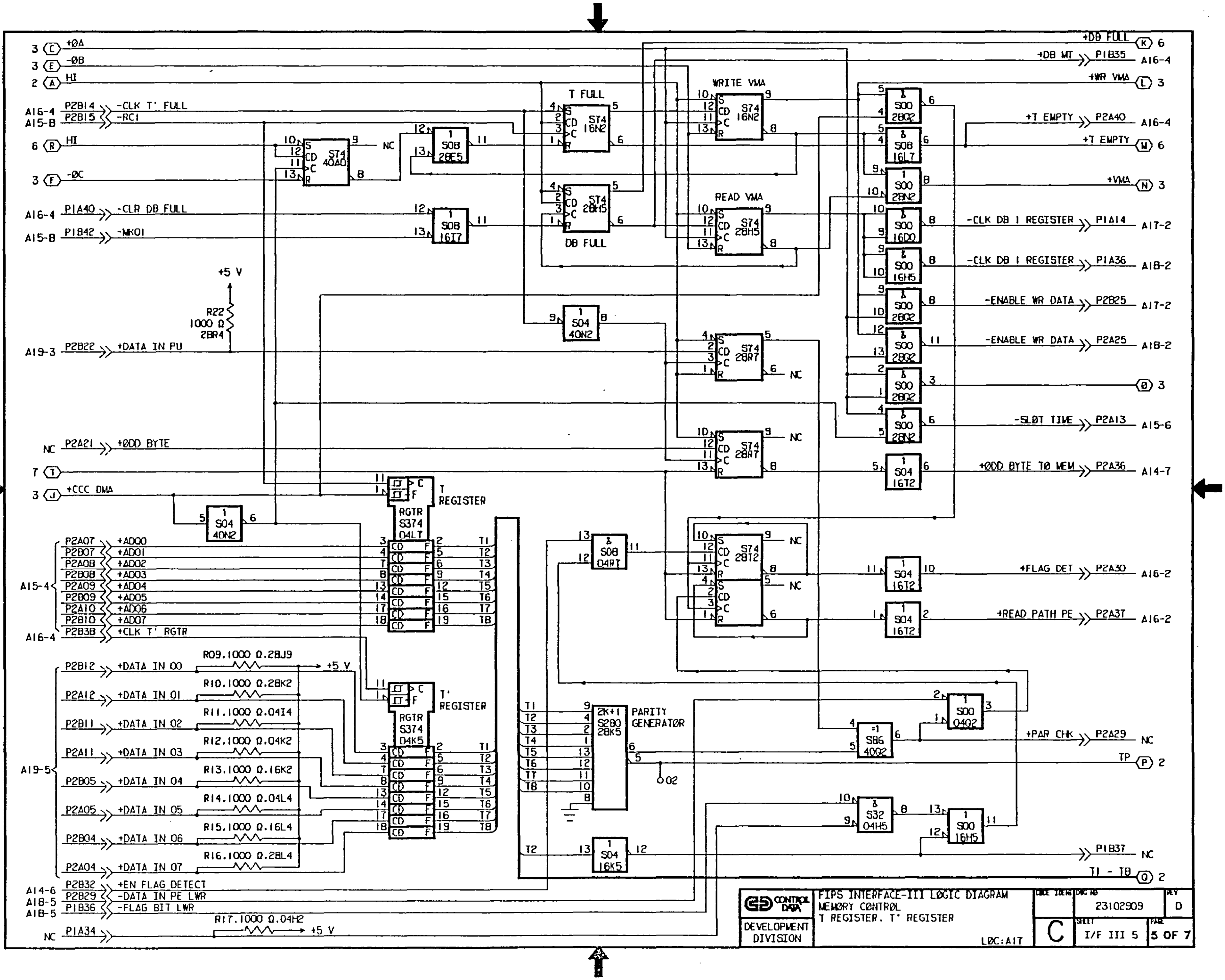
PARITY CHECK CIRCUIT

This circuit compares the DMA read data parity bit (data in PU) with the parity bit generated from the DMA read data after it passes through the T′ register. A Read Path PE signal is sent to the control flag register (A16-2) if an error occurs in transmission of DMA read data.

MEMORY CONTROL

The T full and write valid memory address (VMA) FFs provide the timing signals necessary to write data into memory (A10).

The data bus (DB) full and read VMA FFs provide the timing signals necessary to read data from memory (A10).



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
MEMORY CONTROL
T REGISTER, T' REGISTER

LOC:AIT

CODE IDENT

DWG NO 23102909

REV D

C

SHEET I/F III 5

PAGE 5 OF 7

FIPS INTERFACE - III (A17-6)

BUFFER FULL

A Buffer Full signal is generated by the transfer logic (A14-4) to allow DMA data to be written into the memory buffer until it is full.

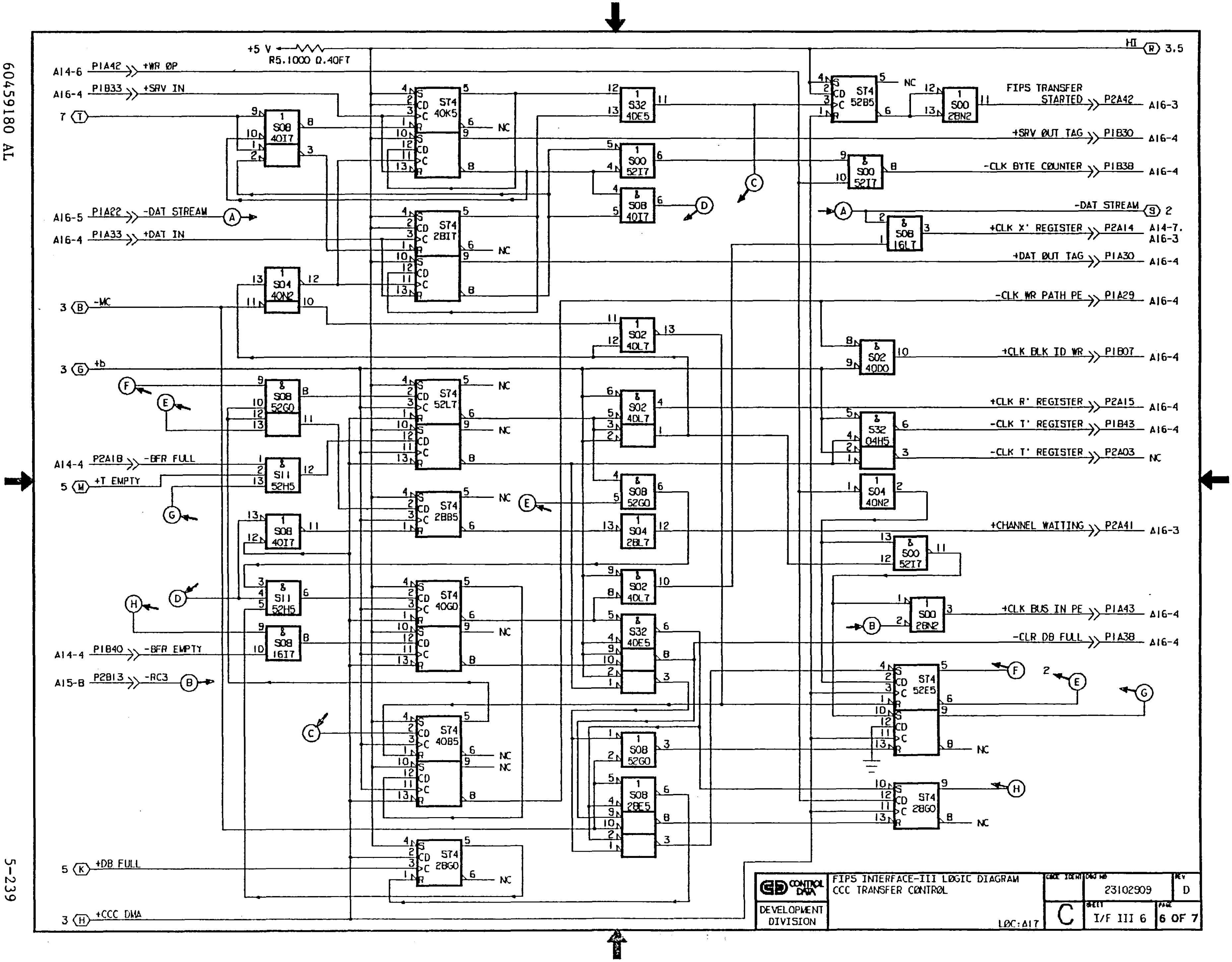
BUFFER EMPTY

The Buffer Empty signal is generated by the transfer logic (A14-4) to allow DMA data to be read from the memory buffer until it is empty.

TRANSFER CONTROL

The transfer control logic uses various input signals including the Buffer Full and Buffer Empty signals to generate control signals and clocks necessary to transfer DMA data between the CYBER interface and the FIPS interface.

The X′ register clock is used for a DMA write operation and the R′ and T′ register clocks are used for a DMA read operation. The byte counter and block ID clocks are used for both read and write operations. The FIPS Transfer Started and Channel Waiting signals are sent to the control flag register of the stream logic (A16-3, A16-2).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
CCC TRANSFER CONTROL

LOC:A17

C

23102909

D

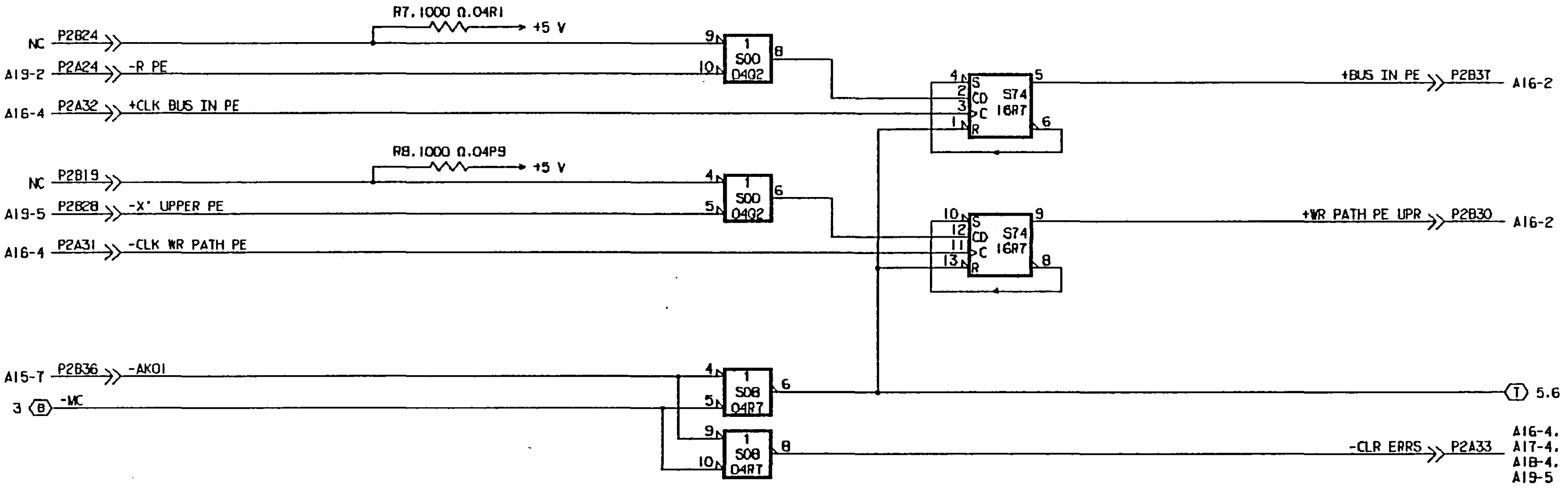
I/F III 6

6 OF 7

FIPS INTERFACE - III (A17-7)

PARITY ERROR LATCHES

These two latches (FFs) hold some of the parity errors that may occur during read and write operations. The parity error signals are sent from the FFs to the control flag register of the stream logic (A16-2).



CONTROL DATA	FIPS INTERFACE-III LOGIC DIAGRAM PARITY ERROR LATCHES	CODE IDENT	DWG NO 23102909	REV D
DEVELOPMENT DIVISION	LOC:A17	C	SHEET I/F III 7	PAGE 7 OF 7

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PAGE							REVISION RECORD					
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A	A	B	B	A	A	B	CA47300	SEE C.O.	MES	10/85	NZ	NZ
C	C	C	C	C	C	C	CA47702	INACTIVE. FOR SERVICE USE ONLY SUPERSEDED BY 53590867	MES	8/18/88	NS	NS
D	D	D	D	D	D	D	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/27/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	L.B. ULFIG	04/85
MFG	B.J. REILAND	04/85
APVD	L.B. ULFIG	04/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
FIPS I/F 3

PWA-53590794
PWB-23140955

SIZE C
FSCM NO. 34010
DWG NO. 23140956
LOC: A17
SHEET IF III IR
PAGE 1 OF 7

FIPS INTERFACE - III (A17-2)

DATA BUS DRIVERS

During a coupler read operation, the upper 8-bit byte (bits T1 through T8) from the T register (A17-5) is transferred from the drivers to the data bus on the bidirectional data lines. The 8-bit byte is then written into memory (A10-5).

DATA BUS RECEIVERS

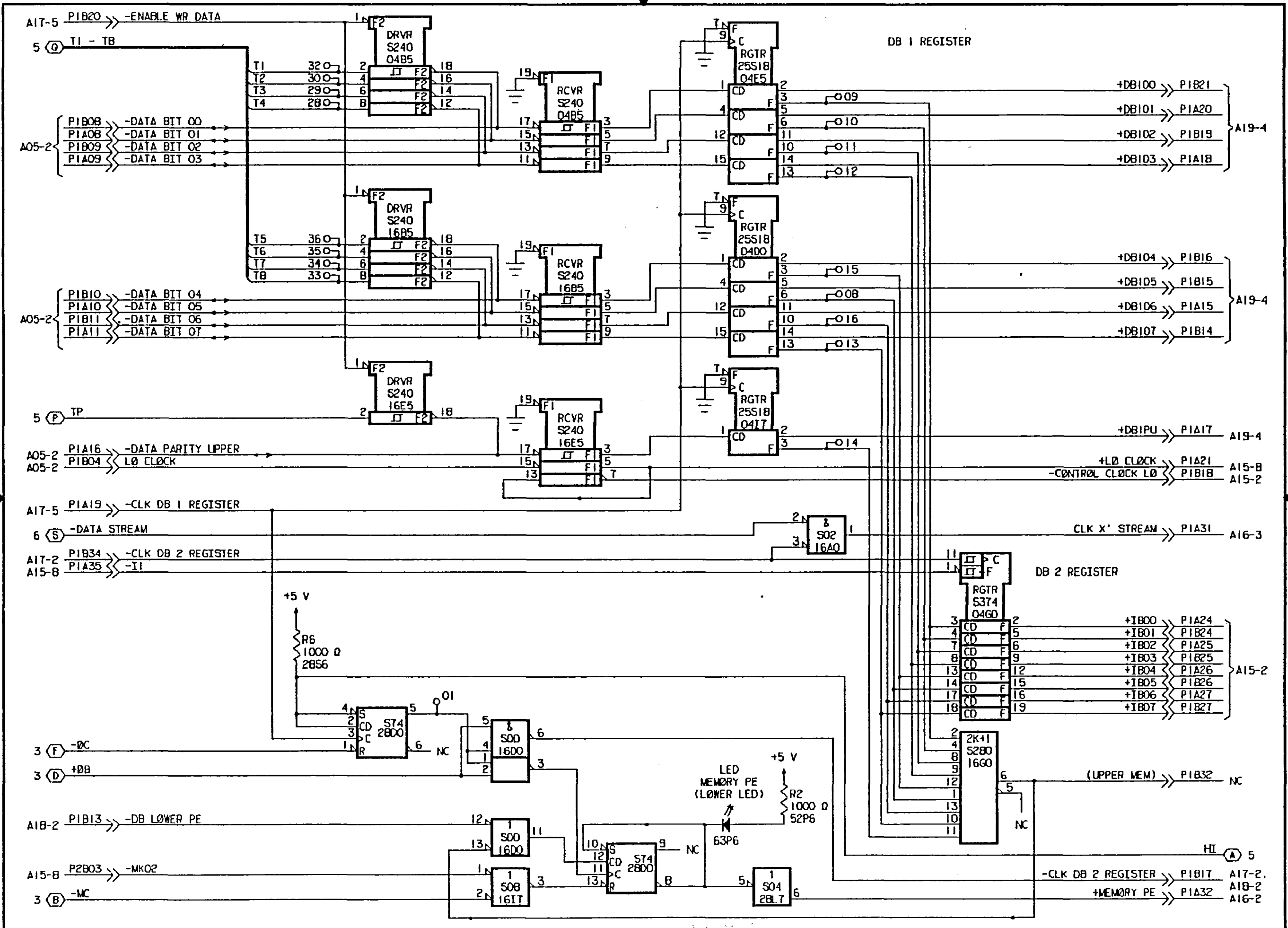
During a coupler write operation, the upper 8-bit byte (bits 00 through 07) is transferred from the data bus to the receivers on the same bidirectional lines used by the data bus drivers. The data bus receivers then send the 8-bit byte to the DB1 register.

DATA BUS REGISTERS (DB1, DB2)

The upper data bus byte from the data bus receivers is clocked into the DB1 register by the Clk DB1 Register signal from the memory control circuit (A17-5). This signal is also used to generate the Clk DB2 Register signal (A17-2) that clocks the upper data byte from the DB1 register to the multiplexer (A19-4) and into the DB2 register to the I bus as bits IB00 through IB07.

DATA BUS PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the upper data bus byte and associated parity bit. The memory parity error LED indicator is not used.



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
DATA BUS RECEIVER/DRIVERS
DB 1 REGISTER. DB 2 REGISTER

LOC:A17

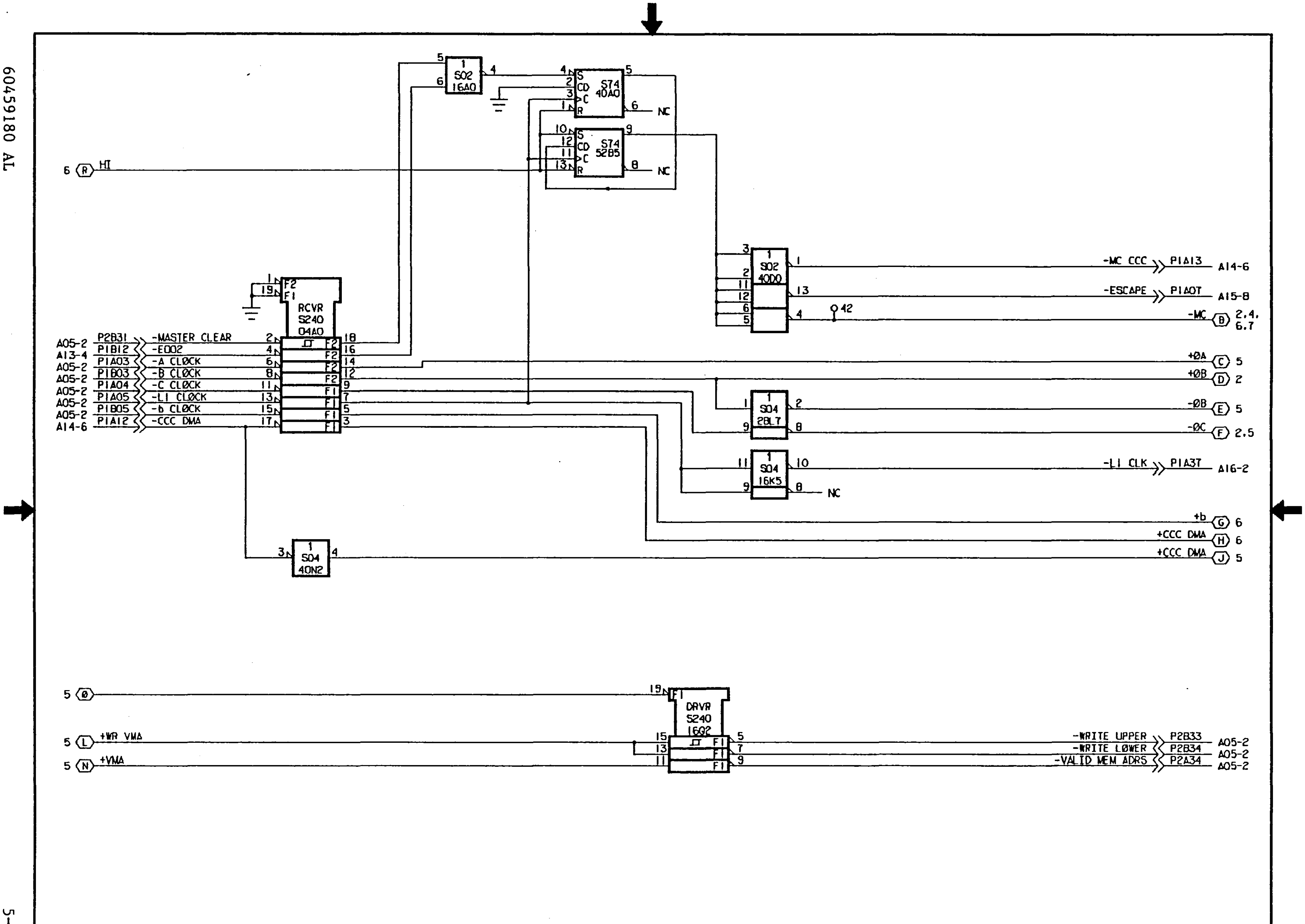
CAGE IDENT	DWG NO	REV
	23140956	C

	SHEET	PAGE
C	I/F III 2R	2 OF 7

FIPS INTERFACE - III (A17-3)

DATA BUS RECEIVERS/DRIVERS

Various clocks and signals including data bus access time clocks for the FIPS interface, processor, and CYBER interface (A, B, and C clocks) and master clear are received from the data bus or transmitted to the data bus via the data bus receivers/drivers.



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
DATA BUS RECEIVERS/DRIVERS

LOC:A17

CODE IDENT	DWG NO	REV
C	23140956	D
	SHEET I/F III 3R	PAGE 3 OF 7

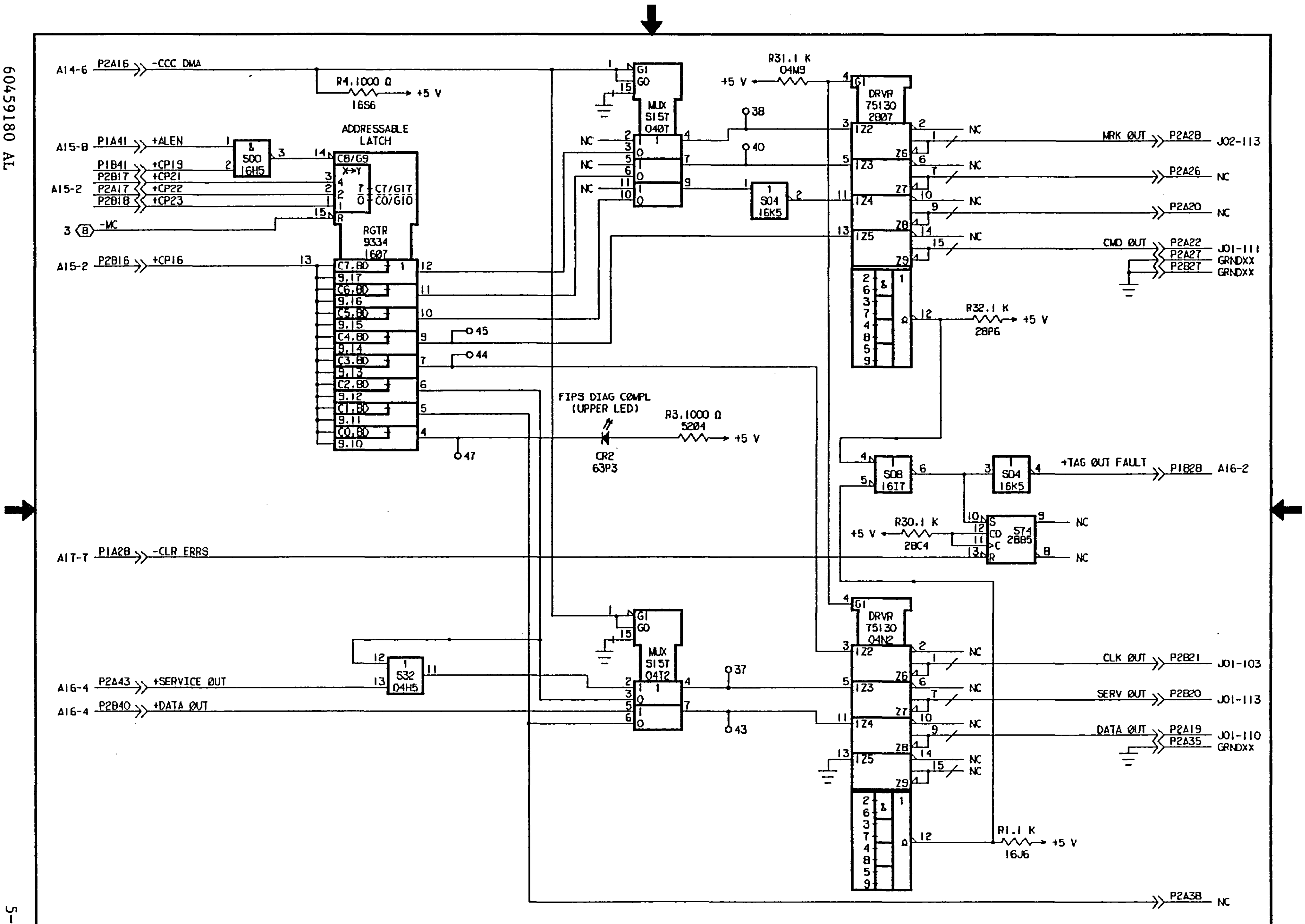
FIPS INTERFACE - III (A17-4)

ADDRESSABLE LATCH REGISTER

The outputs of the addressable latch register are selected by microcode bits CP19, CP21, CP22, and CP23 from the FIPS interface UDI sequencer (A15-2). The register outputs are sent via the multiplexer circuits to the tag transmitters. The associated LED indicator (CR2) is not used and remains unlit.

TAG TRANSMITTERS

These circuits transmit signals on the tag lines to the external FIPS device. The tag lines control the information that is present on the bus-out lines (A19-5).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
TAG TRANSMITTERS

LOC:A17

CAGE IDENT	DWG NO	REV
	23140956	D
C	SHEET I/F III 4R	PAGE 4 OF 7

FIPS INTERFACE - III (A17-5)

T REGISTER

The upper 8-bit byte of assembly/disassembly information (bits AD00 through AD07) is clocked into the T register during a UDI read operation. The read data bits (T1 through T8) in the T register are then sent to the data bus drivers (A17-2) and to the parity generator.

T′ REGISTER

The upper 8-bit byte of data bus information (data in bits 00 through 07) is clocked into the T′ register during a DMA read operation. The read data bits (T1 through T8) are sent to the parity generator (A17-5) and to the data bus drivers (A17-2).

PARITY GENERATION

A parity bit is generated on the data from the T or T′ register. This parity bit (TP) is sent to the data bus driver (A17-2) along with the read data bits (T1 through T8). The parity generator also sends a parity bit to the parity check circuit (A17-5).

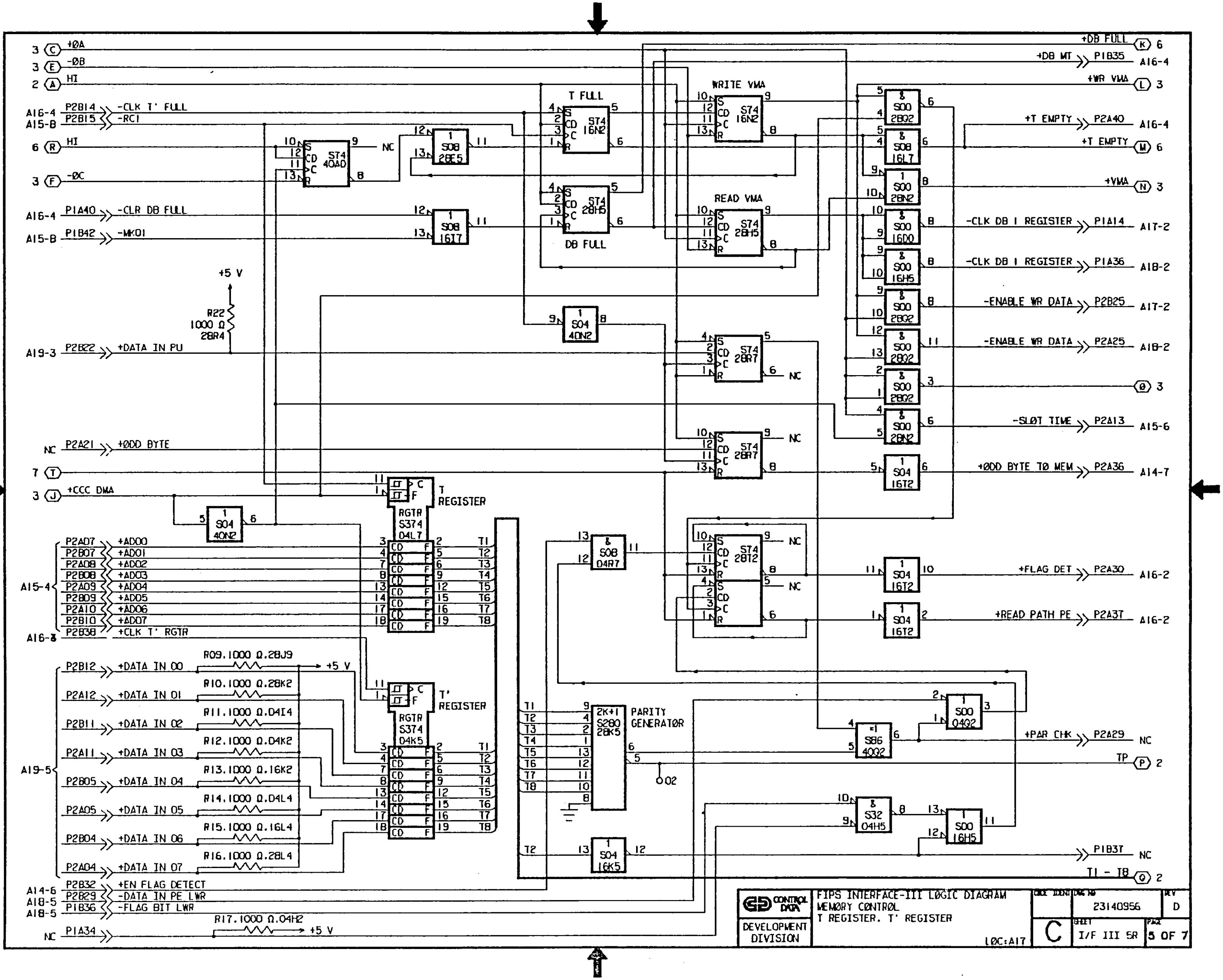
PARITY CHECK CIRCUIT

This circuit compares the DMA read data parity bit (data in PU) with the parity bit generated from the DMA read data after it passes through the T′ register. A Read Path PE signal is sent to the control flag register (A16-2) if an error occurs in transmission of DMA read data.

MEMORY CONTROL

The T full and write valid memory address (VMA) FFs provide the timing signals necessary to write data into memory (A10).

The data bus (DB) full and read VMA FFs provide the timing signals necessary to read data from memory (A10).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
MEMØRY CØNTRØL
T REGISTER. T' REGISTER

LØC:A17

CODE IDENT	DWG NO	REV
C	23140956	D
	SHEET I/F III 5R	PAGE 5 OF 7

FIPS INTERFACE - III (A17-6)

BUFFER FULL

A Buffer Full signal is generated by the transfer logic (A14-4) to allow DMA data to be written into the memory buffer until it is full.

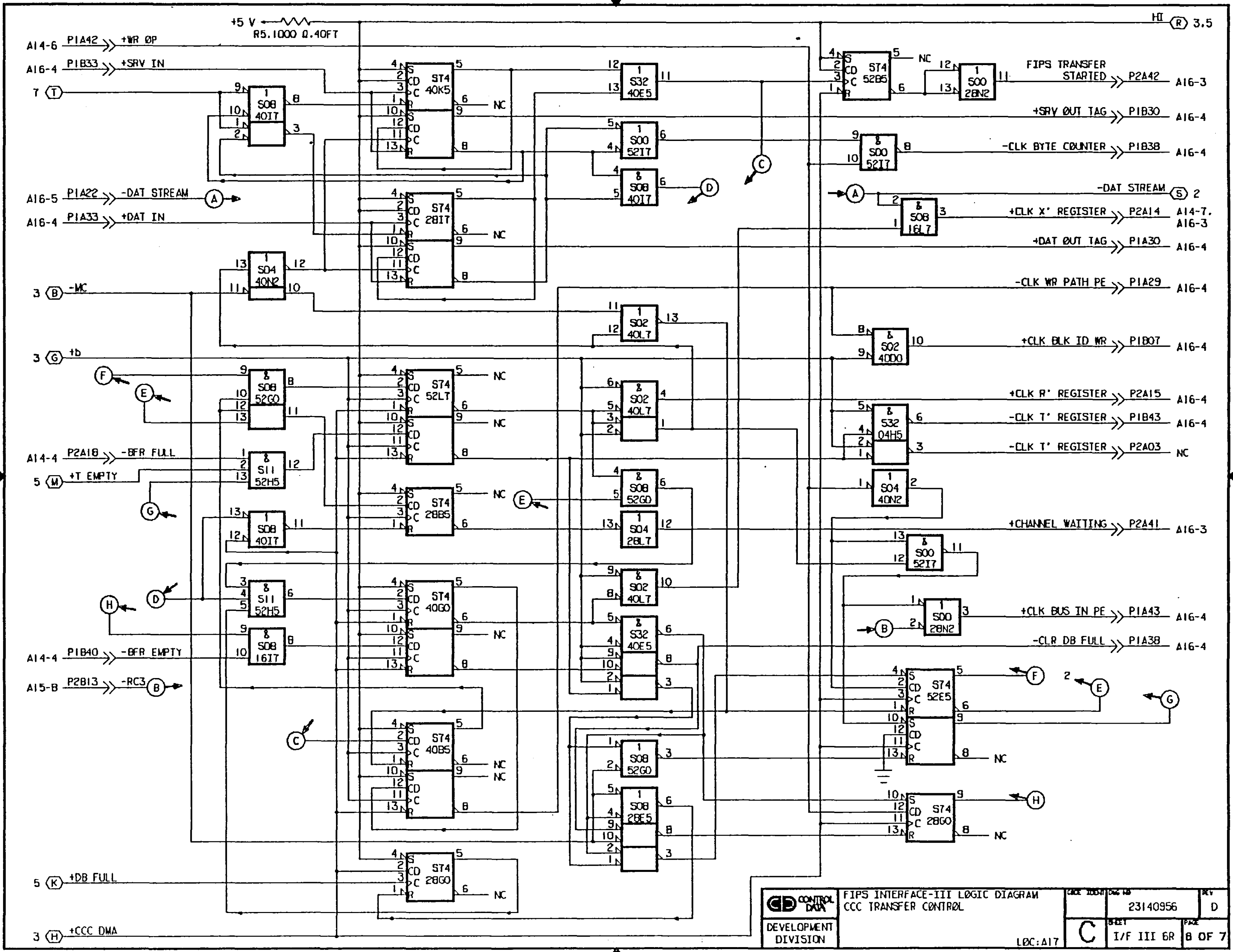
BUFFER EMPTY

The Buffer Empty signal is generated by the transfer logic (A14-4) to allow DMA data to be read from the memory buffer until it is empty.

TRANSFER CONTROL

The transfer control logic uses various input signals including the Buffer Full and Buffer Empty signals to generate control signals and clocks necessary to transfer DMA data between the CYBER interface and the FIPS interface.

The X′ register clock is used for a DMA write operation and the R′ and T′ register clocks are used for a DMA read operation. The byte counter and block ID clocks are used for both read and write operations. The FIPS Transfer Started and Channel Waiting signals are sent to the control flag register of the stream logic (A16-3, A16-2).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
CCC TRANSFER CONTROL

LOC:A17

CAGE IDENT

DWG NO 23140956

REV D

C

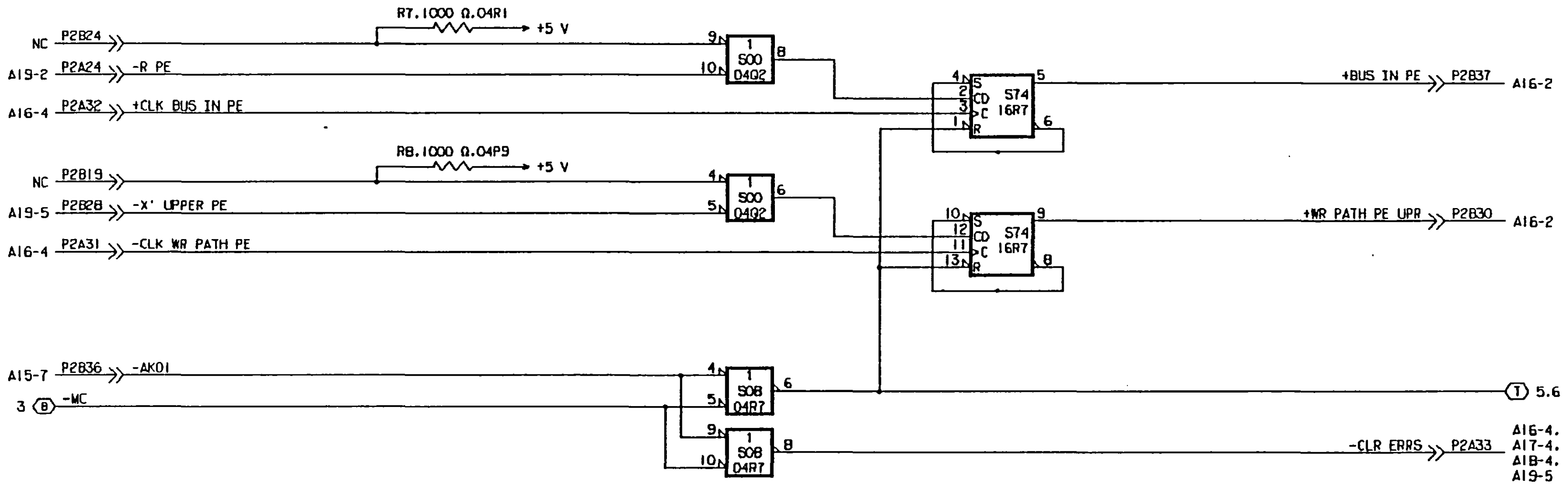
SHEET I/F III 6R

PAGE 8 OF 7

FIPS INTERFACE - III (A17-7)

PARITY ERROR LATCHES

These two latches (FFs) hold some of the parity errors that may occur during read and write operations. The parity error signals are sent from the FFs to the control flag register of the stream logic (A16-2).



FIPS INTERFACE-III LOGIC DIAGRAM
PARITY ERROR LATCHES

CONTROL DATA
DEVELOPMENT DIVISION

LOC:A17

CODE IDENT	DWG NO	REV
C	23140956	D
SHEET	I/F III 7R	PAGE 7 OF 7

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PAGE							REVISION RECORD					
7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
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B	B	B	B	B	B	B	CA47702	SEE NOTE 4	MES	8/13/86	NS	NS
C	C	C	C	C	C	C	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/28/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN TOLERANCES PLACE ± PLACE ± ANGLES ±	DWN	E F ARLANDSON	12/85
	CHKD	N ZAK	12/85
	ENGR	R T HENNING	02/86
MATERIAL	MFG	B J REILAND	02/86
	APVD	R T HENNING	02/86
FINISH	EQUIP. NO. FR205-A		
	THIRD ANGLE PROJECTION		

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
FIPS I/F 3

PWA-53590866

PWB-53590867

SIZE	FSCM NO.	DWG NO.
C	34010	53590868

LOC: A17

SHEET IF III 1-F

PAGE 1 OF 7

FIPS INTERFACE - III (A17-2)

DATA BUS DRIVERS

During a coupler read operation, the upper 8-bit byte (bits T1 through T8) from the T register (A17-5) is transferred from the drivers to the data bus on the bidirectional data lines. The 8-bit byte is then written into memory (A10-5).

DATA BUS RECEIVERS

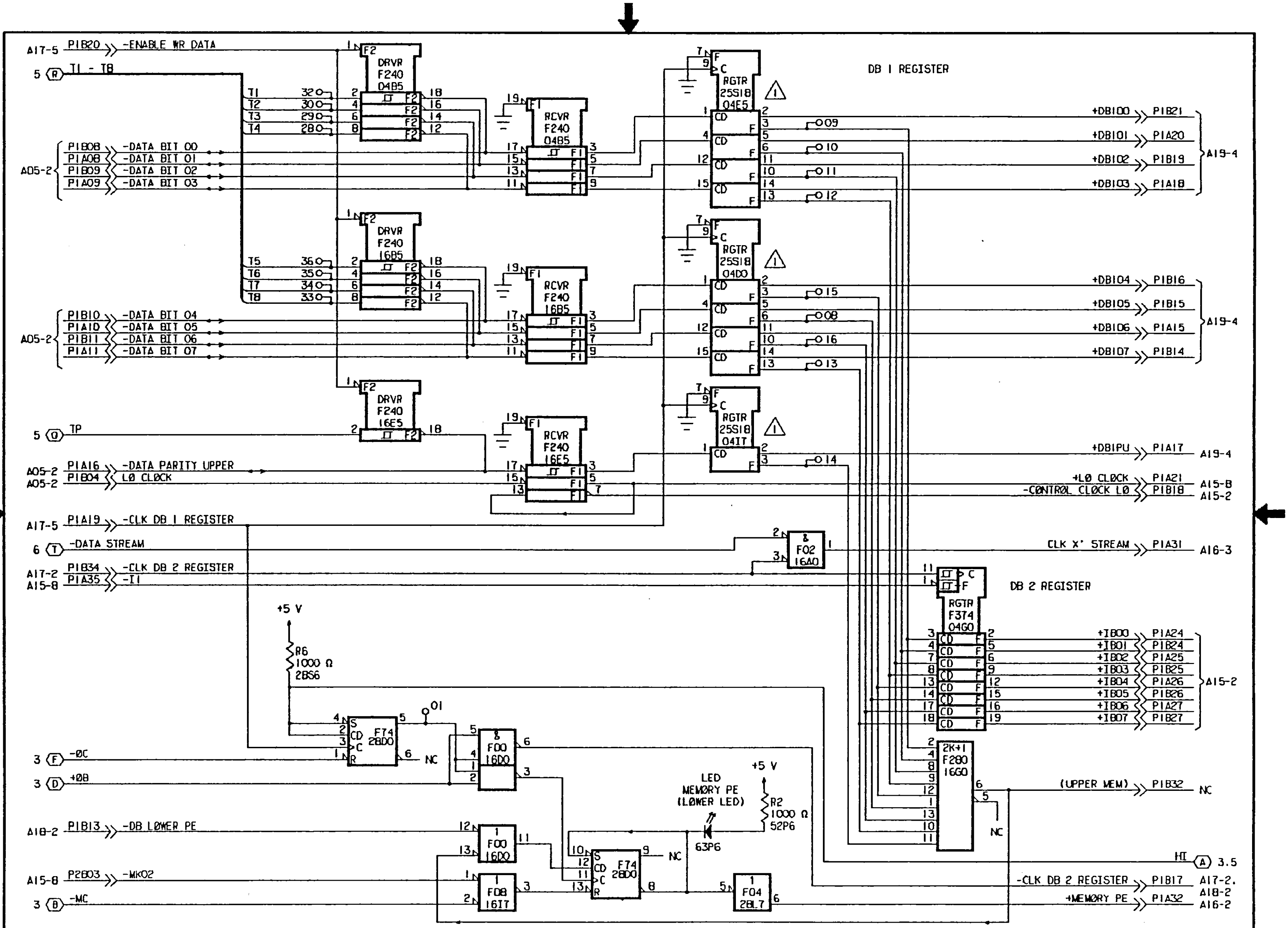
During a coupler write operation, the upper 8-bit byte (bits 00 through 07) is transferred from the data bus to the receivers on the same bidirectional lines used by the data bus drivers. The data bus receivers then send the 8-bit byte to the DB1 register.

DATA BUS REGISTERS (DB1, DB2)

The upper data bus byte from the data bus receivers is clocked into the DB1 register by the Clk DB1 Register signal from the memory control circuit (A17-5). This signal is also used to generate the Clk DB2 Register signal (A17-2) that clocks the upper data byte from the DB1 register to the multiplexer (A19-4) and into the DB2 register to the I bus as bits IB00 through IB07.

DATA BUS PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the upper data bus byte and associated parity bit. The memory parity error LED indicator is not used.



NØTES:
⚠1 CHIP IDENTIFIERS WERE NØT CHANGED ØN PWA-53590866.

CONTROL DATA
DEVELOPMENT DIVISION

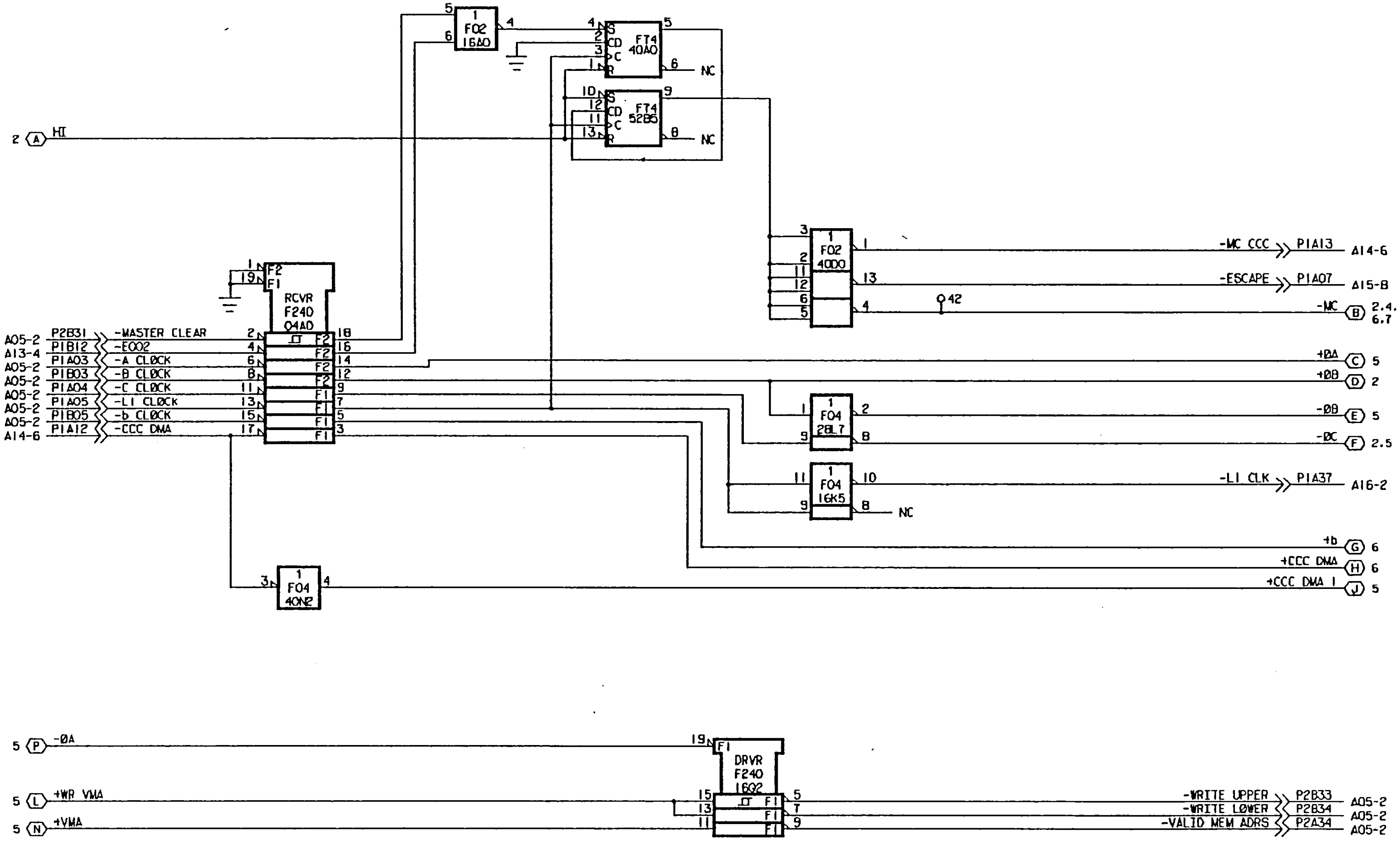
FIPS INTERFACE-III LØGIC DIAGRAM
DATA BUS RECEIVER/DRIVERS
DB 1 REGISTER, DB 2 REGISTER
LØC:A17

CODE IDENT
DWG NO 53590868
REV C
C
SHEET I/F III 2-F
PAGE 2 OF 7

FIPS INTERFACE - III (A17-3)

DATA BUS RECEIVERS/DRIVERS

Various clocks and signals including data bus access time clocks for the FIPS interface, processor, and CYBER interface (A, B, and C clocks) and master clear are received from the data bus or transmitted to the data bus via the data bus receivers/drivers.



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
DATA BUS RECEIVERS/DRIVERS

LØC:A17

CODE IDENT
C

DWG NO
53590868

REV
C

SHEET
I/F III 3-F

PAGE
3 OF 7

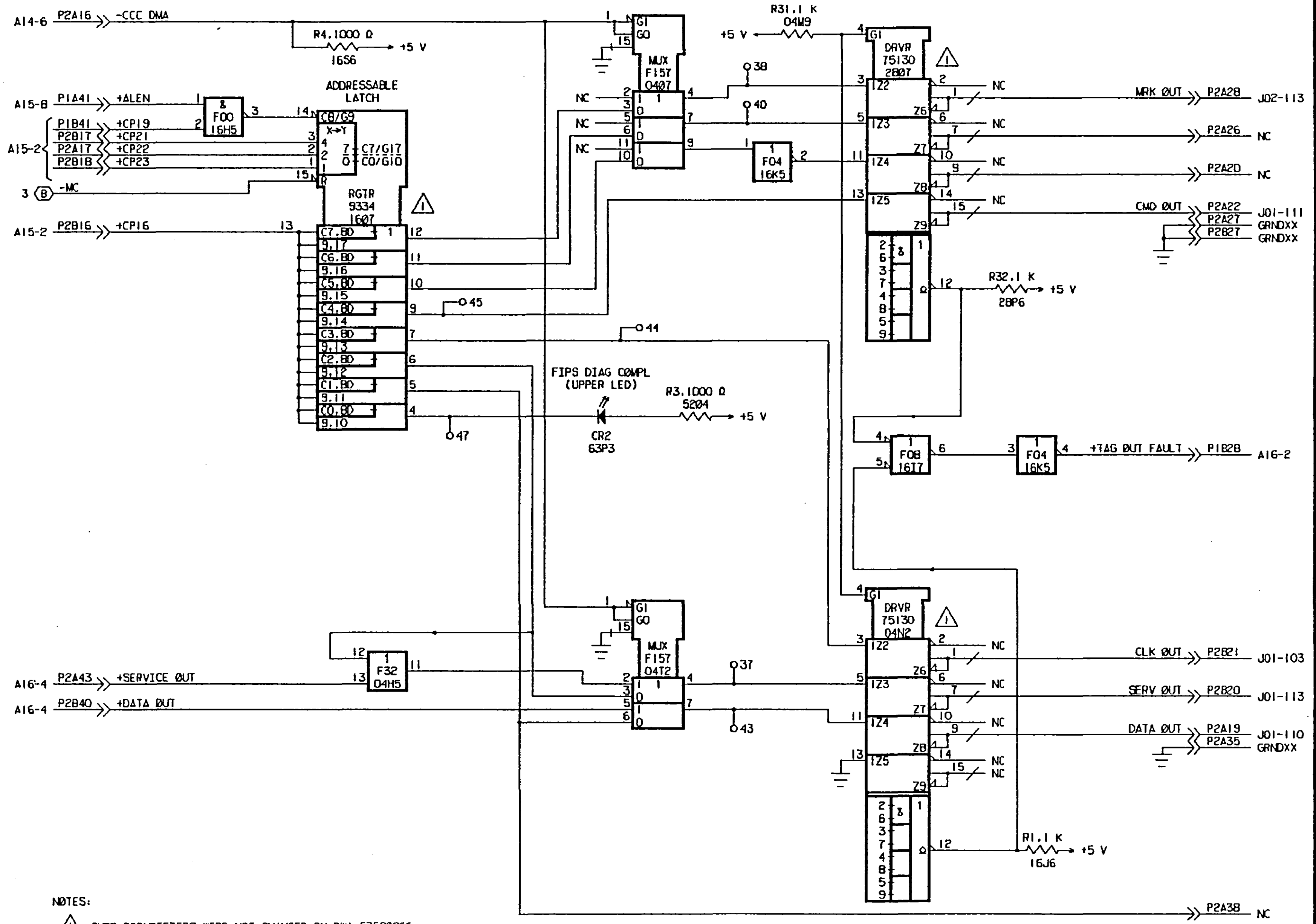
FIPS INTERFACE - III (A17-4)

ADDRESSABLE LATCH REGISTER

The outputs of the addressable latch register are selected by microcode bits CP19, CP21, CP22, and CP23 from the FIPS interface UDI sequencer (A15-2). The register outputs are sent via the multiplexer circuits to the tag transmitters. The associated LED indicator (CR2) is not used and remains unlit.

TAG TRANSMITTERS

These circuits transmit signals on the tag lines to the external FIPS device. The tag lines control the information that is present on the bus-out lines (A19-5).



NOTES:

⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590866.

CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
TAG TRANSMITTERS

LOC:A17

DWG NO 53590868

REV C

C

SHEET I/F III 4-F

PAGE 4 OF 7

FIPS INTERFACE - III (A17-5)

T REGISTER

The upper 8-bit byte of assembly/disassembly information (bits AD00 through AD07) is clocked into the T register during a UDI read operation. The read data bits (T1 through T8) in the T register are then sent to the data bus drivers (A17-2) and to the parity generator.

T′ REGISTER

The upper 8-bit byte of data bus information (data in bits 00 through 07) is clocked into the T′ register during a DMA read operation. The read data bits (T1 through T8) are sent to the parity generator (A17-5) and to the data bus drivers (A17-2).

PARITY GENERATION

A parity bit is generated on the data from the T or T′ register. This parity bit (TP) is sent to the data bus driver (A17-2) along with the read data bits (T1 through T8). The parity generator also sends a parity bit to the parity check circuit (A17-5).

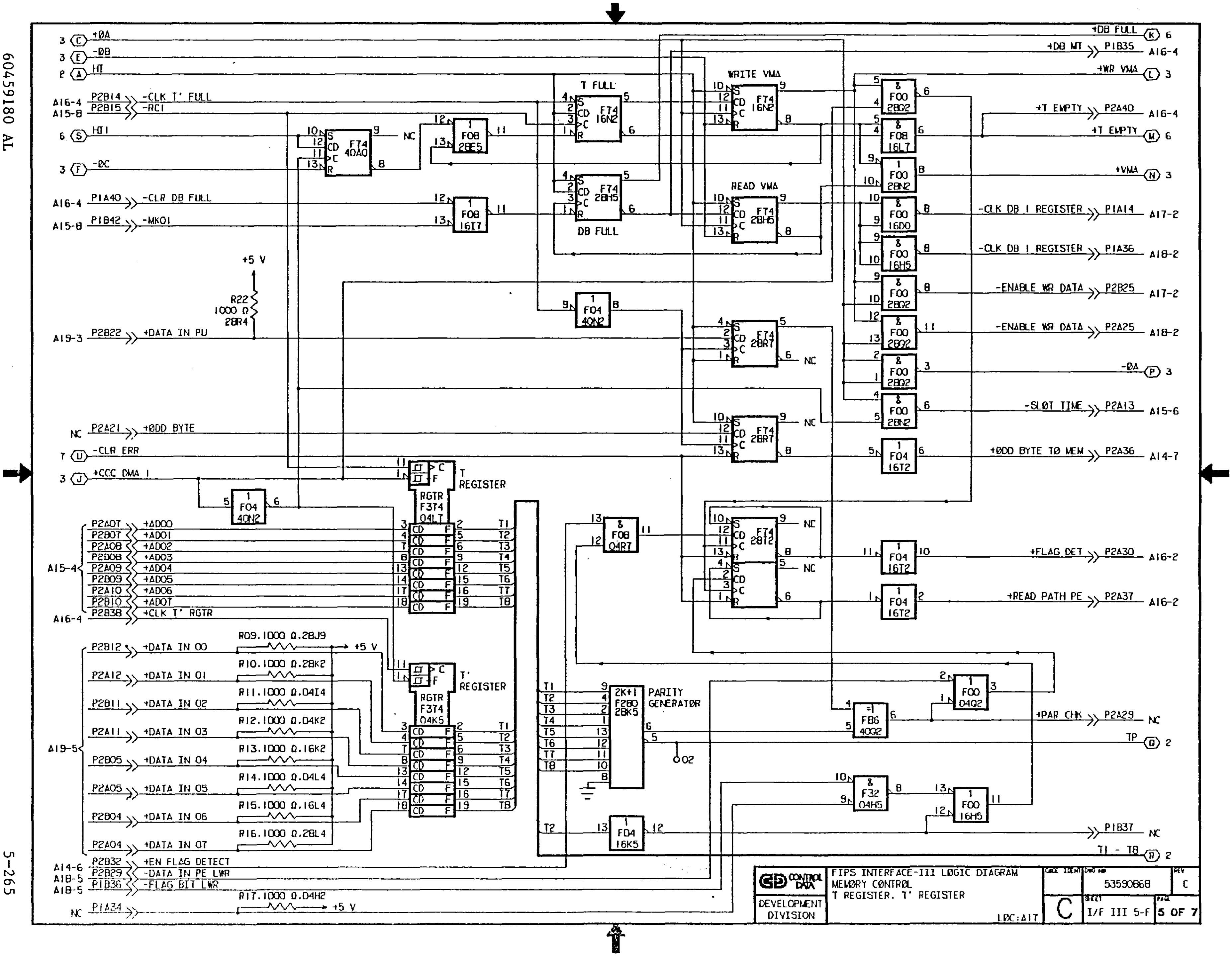
PARITY CHECK CIRCUIT

This circuit compares the DMA read data parity bit (data in PU) with the parity bit generated from the DMA read data after it passes through the T′ register. A Read Path PE signal is sent to the control flag register (A16-2) if an error occurs in transmission of DMA read data.

MEMORY CONTROL

The T full and write valid memory address (VMA) FFs provide the timing signals necessary to write data into memory (A10).

The data bus (DB) full and read VMA FFs provide the timing signals necessary to read data from memory (A10).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
MEMORY CONTROL
T REGISTER. T' REGISTER

LPC:A1T

CODE IDENT	DWG NO	REV
C	53590868	C
	SHEET I/F III 5-F	PAGE 5 OF 7

FIPS INTERFACE - III (A17-6)

BUFFER FULL

A Buffer Full signal is generated by the transfer logic (A14-4) to allow DMA data to be written into the memory buffer until it is full.

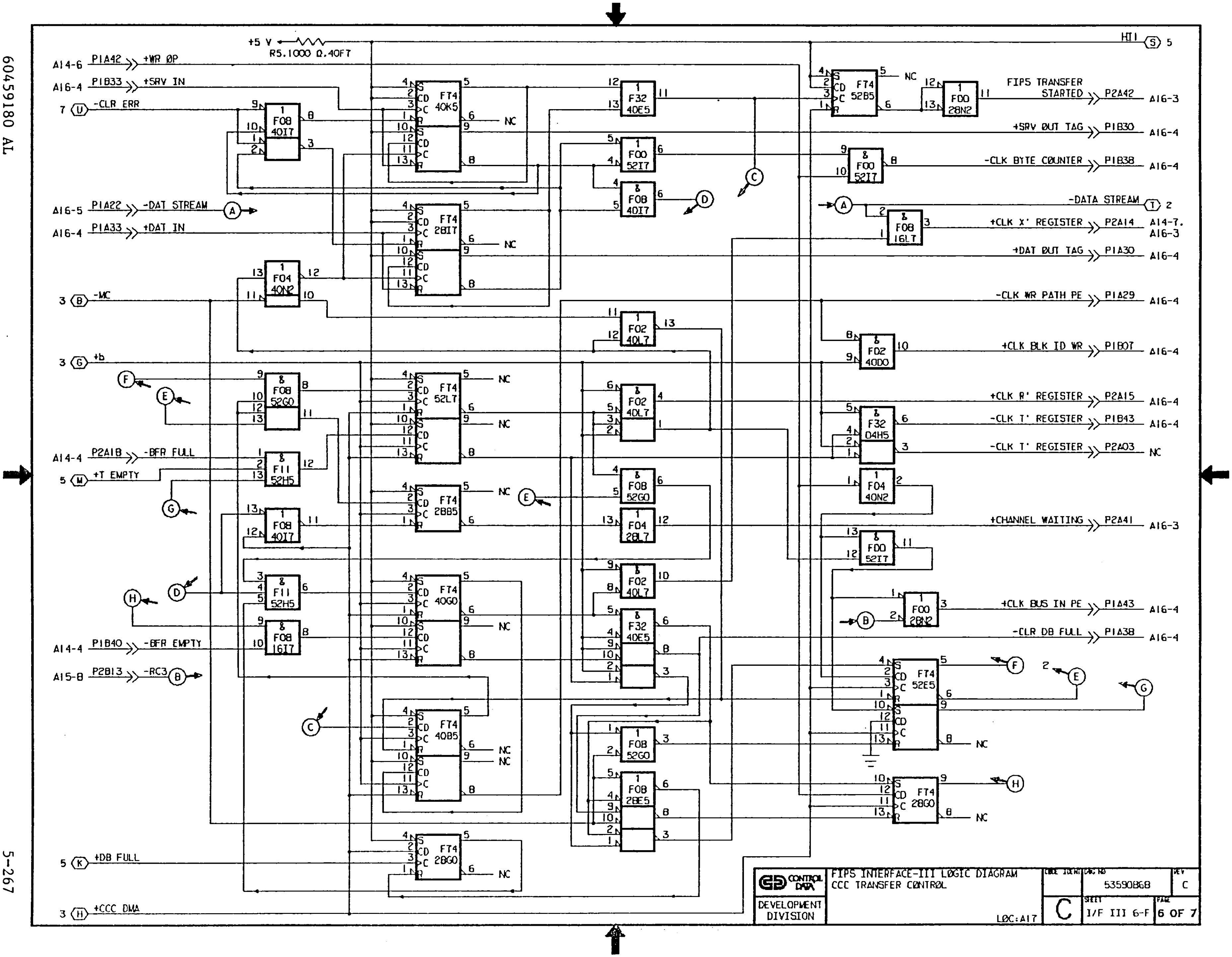
BUFFER EMPTY

The Buffer Empty signal is generated by the transfer logic (A14-4) to allow DMA data to be read from the memory buffer until it is empty.

TRANSFER CONTROL

The transfer control logic uses various input signals including the Buffer Full and Buffer Empty signals to generate control signals and clocks necessary to transfer DMA data between the CYBER interface and the FIPS interface.

The X′ register clock is used for a DMA write operation and the R′ and T′ register clocks are used for a DMA read operation. The byte counter and block ID clocks are used for both read and write operations. The FIPS Transfer Started and Channel Waiting signals are sent to the control flag register of the stream logic (A16-3, A16-2).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
CCC TRANSFER CONTROL

LOC:A17

CODE IDENT C

DWG NO 53590868

REV C

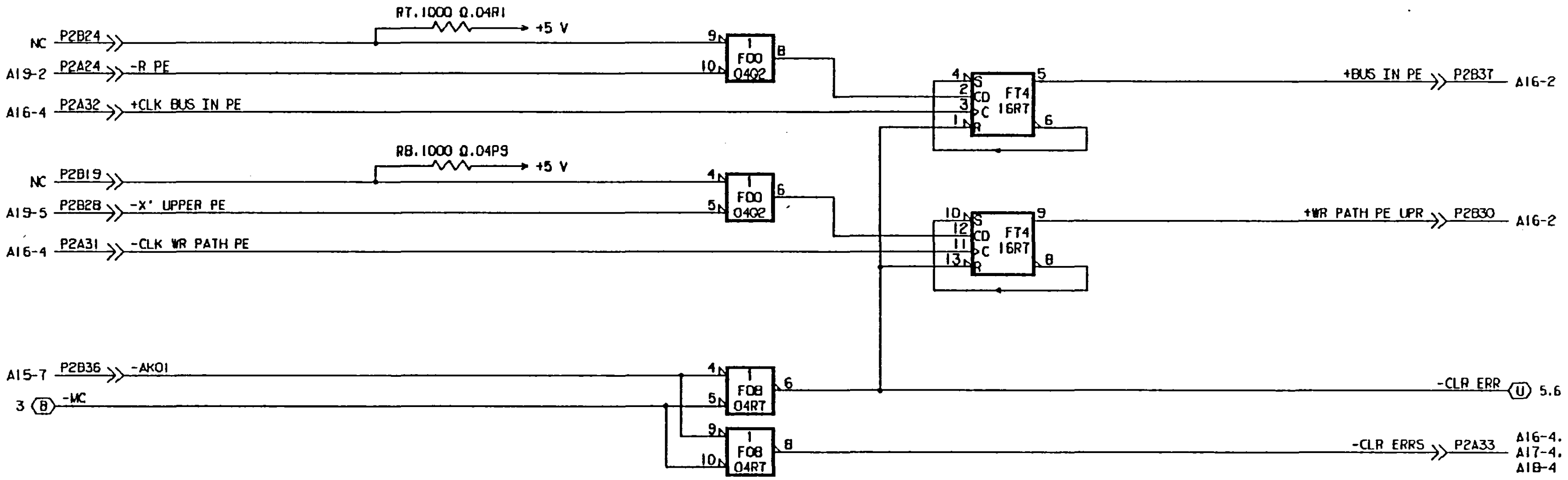
SHEET I/F III 6-F

PAGE 6 OF 7

FIPS INTERFACE - III (A17-7)

PARITY ERROR LATCHES

These two latches (FFs) hold some of the parity errors that may occur during read and write operations. The parity error signals are sent from the FFs to the control flag register of the stream logic (A16-2).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
PARITY ERROR LATCHES

LOC:A17

DWG NO 53590868

REV C

C

SHEET I/F III 7-F

PAGE 7 OF 7

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PAGE							REVISION RECORD					
7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	LBU
A	A	A	B	A	A	B	CA46164	SEE C.O.	MES	04/85	NZ	LBU
A	A	C	C	A	A	C	CA47300	SEE C.O.	MES	10/85	NZ	NZ
D	D	D	D	D	D	D	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/26/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	L.B. ULFIG	04/85
MFG	B.J. REILAND	04/85
APVD	L.B. ULFIG	04/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL. MINN.

TITLE

LOGIC DIAGRAM
FIPS I/F 3

PWA-53590793
PWB-24670928

SIZE C
FSCM NO. 34010
DWG NO. 23102909
LOC: A1B
SHEET IF III 1B
PAGE 1 OF 7

FIPS INTERFACE - III (A18-2)

DATA BUS DRIVERS

During a coupler read operation, the lower 8-bit byte (bits T1 through T8) from the T register (A18-5) is sent from the drivers to the data bus on bidirectional pins. The 8-bit byte is then written into memory (A10-5).

DATA BUS RECEIVERS

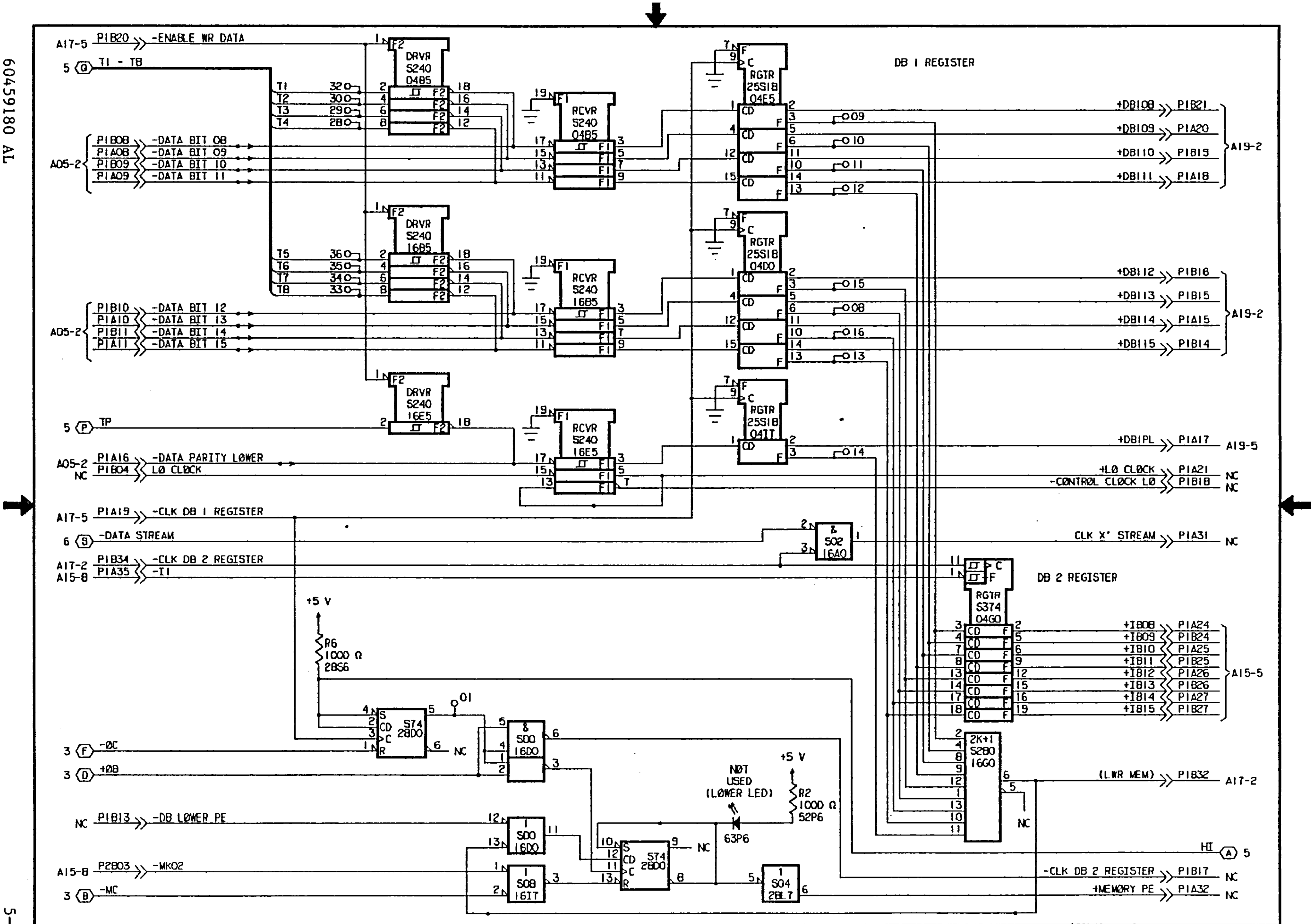
During a coupler write operation, the lower 8-bit byte (bits 08 through 15) is read from memory onto the data bus and sent to the receivers on the same bidirectional pins used by the data bus drivers. The receivers send the 8-bit byte to the DB1 register.

DATA BUS REGISTERS (DB1/DB2)

The lower data bus bytes from the data bus receivers are clocked into the DB1 register by the Clk DB1 Register signal from the memory control circuit (A17-5). This signal is also used to generate the Clk DB2 Register signal (A17-2) that clocks the lower data byte from the DB1 register into the DB2 register, to the data bus parity check circuit, and to the data byte compare circuit (A19-2). The lower data byte (bits IB08 through IB15) is sent from the DB2 register to the I bus.

DATA BUS PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the lower data bus byte and associated parity bit. The memory parity error LED lights if an error occurs in transmission of the lower data bus byte.



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
DATA BUS RECEIVER/DRIVERS
DB 1 REGISTER. DB 2 REGISTER

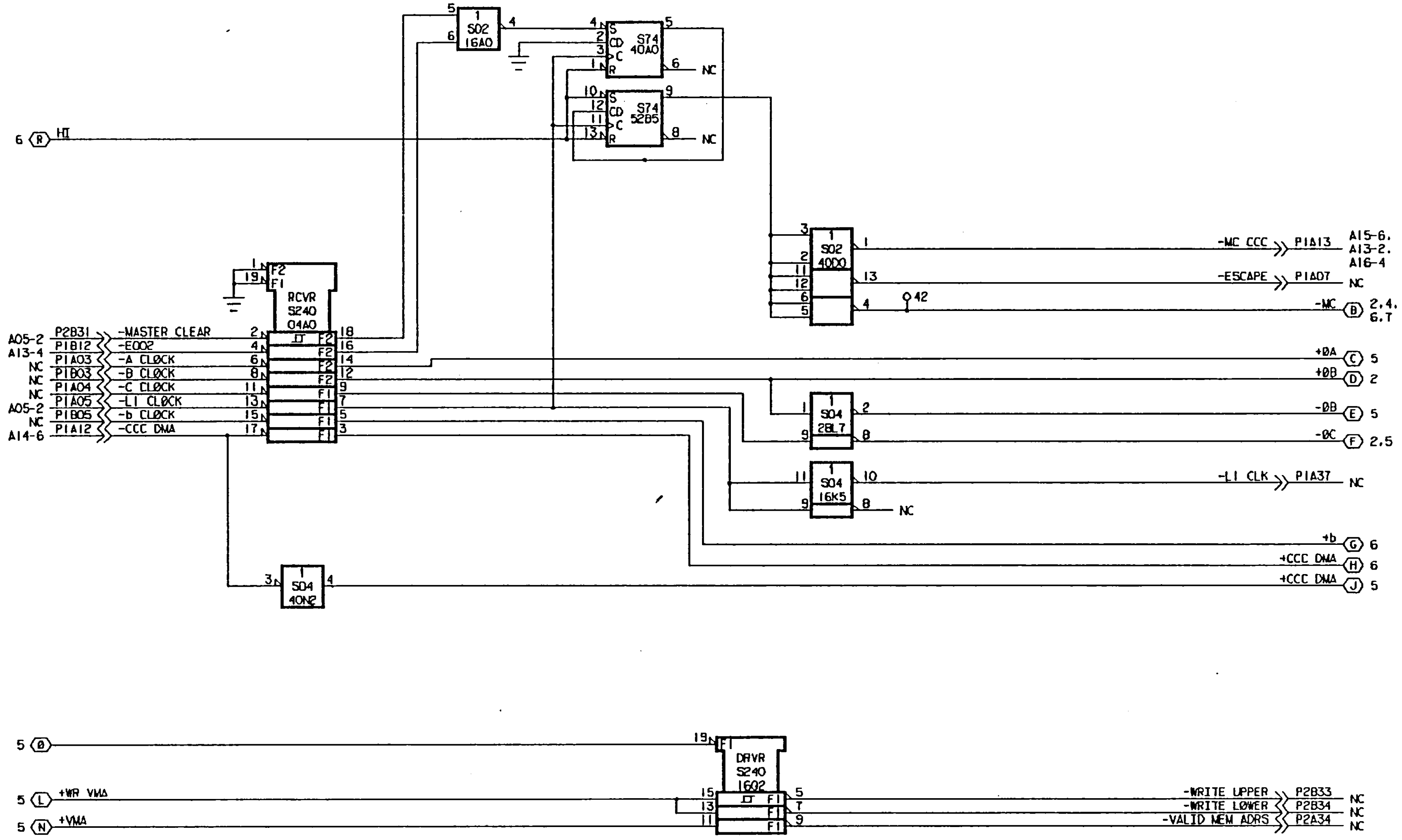
LOC:A18

CODE IDENT	DWG NO	REV
C	23102909	D
	SHEET I/F III 2B	PAGE 2 OF 7

FIPS INTERFACE - III (A18-3)

DATA BUS RECEIVERS/DRIVERS

Various clocks and signals including bus master clear are received from the data bus. The data bus drivers on this logic module are not used.



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
DATA BUS RECEIVERS/DRIVERS

LOC:A1B

CODE IDENT C

DWG NO 23102909

REV D

SHEET I/F III 38

PAGE 3 OF 7

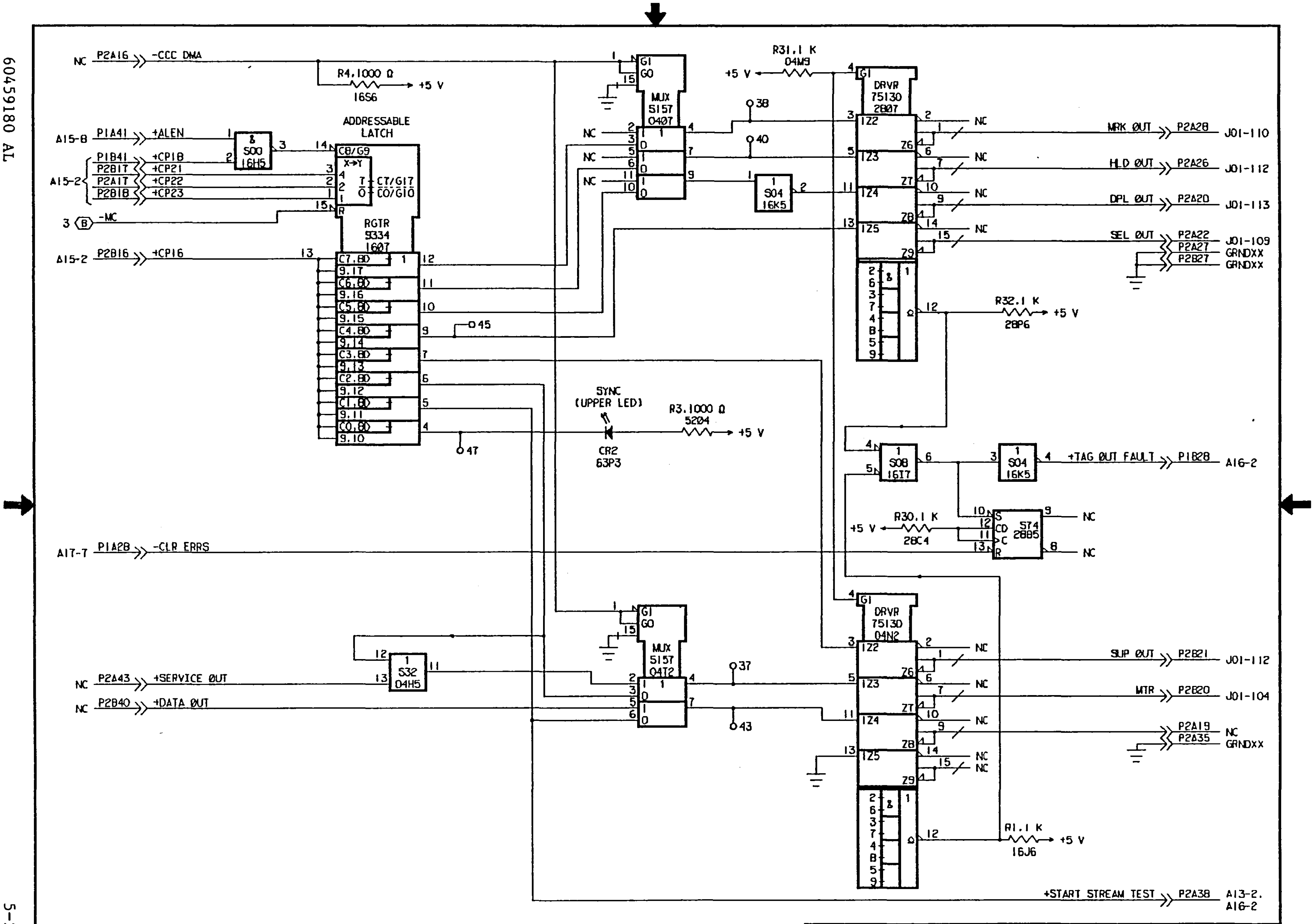
FIPS INTERFACE - III (A18-4)

ADDRESSABLE LATCH REGISTER

The outputs of this register are selected by microcode bits CP18, CP21, CP22, and CP23 from the FIPS interface UDI sequencer (A15-2). The register outputs are sent through the multiplexer circuits to the tag transmitters. The FIPS diagnostic complete LED indicator lights when the internal FIPS interface diagnostic starts running and goes out upon successful completion of the diagnostic test. The indicator remains lit if an error is detected.

TAG TRANSMITTERS

These circuits transmit signals on the tag lines to the external FIPS device. The tag lines control information that is present on the bus out lines (A19-5).



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
TAG TRANSMITTERS

LOC:A1B

CODE IDENT
C
DWG NO 23102909
REV D
SHEET I/F III 4B
PAGE 4 OF 7

FIPS INTERFACE - III (A18-5)

T REGISTER

The lower 8-bit byte of assembly/disassembly information (bits AD08 through AD15) is clocked into the T register during a UDI read operation. The read data bits (T1 through T8) in the T register are then sent to the data bus drivers (A18-2) and to the parity generator.

T´ REGISTER

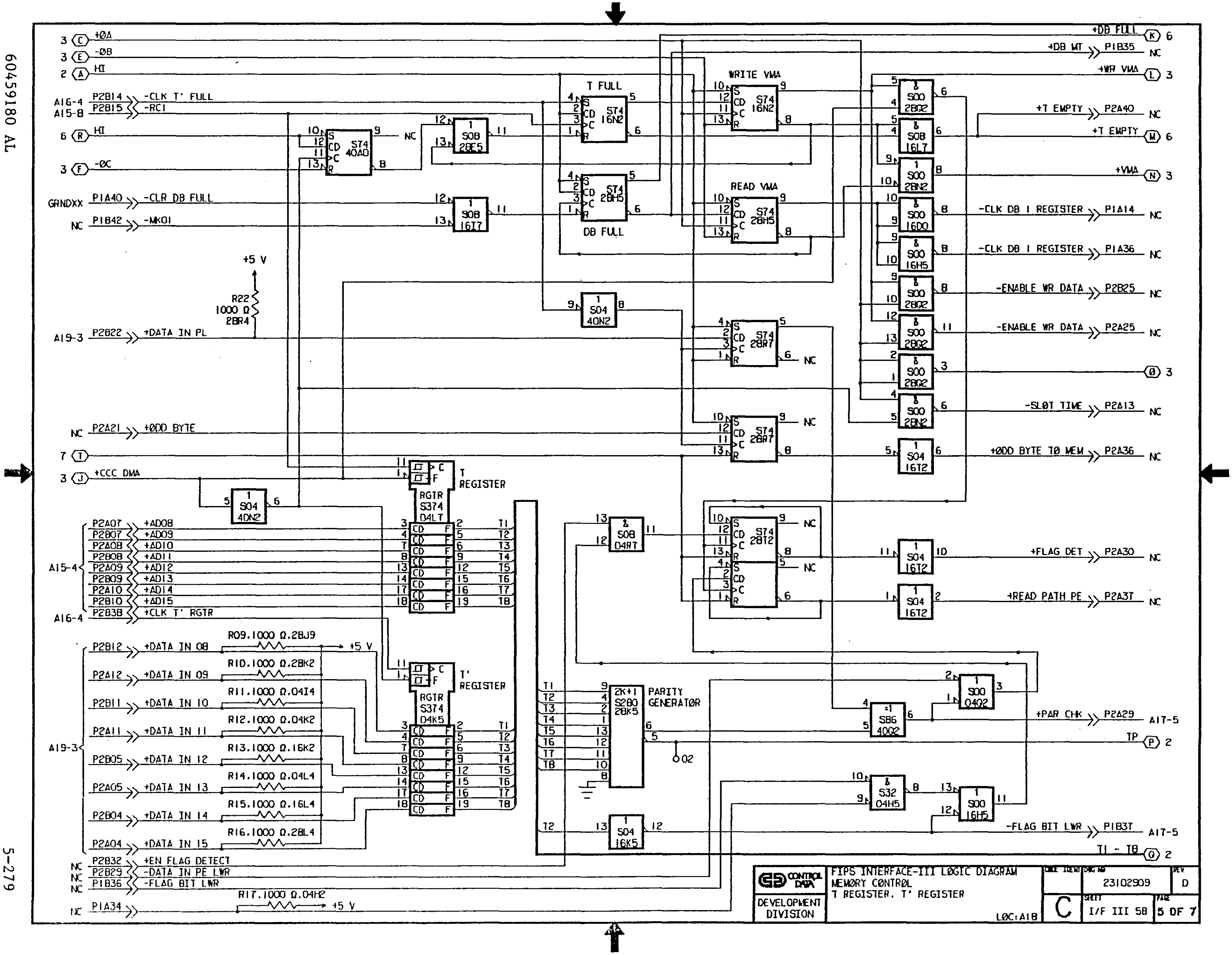
The lower 8-bit byte of data bus information (data-in bits 08 through 15) is clocked into the T´ register during a DMA read operation. The read data bits (T1 through T8) are sent to the parity generator (A18-5) and to the data bus drivers (A18-2).

PARITY GENERATION

A parity bit is generated on the data from the T or T´ register. This parity bit (TP) is sent to the data bus driver (A17-2) along with the read data bits (T1 through T8). The parity generator also sends a parity bit to the parity check circuit (A17-5).

FLAG BIT

This bit is used to detect illegal 6-bit codes read from the code conversion read RAM (A19-3).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
MEMØRY CØNTRØL
T REGISTER, T' REGISTER

LØC:A18

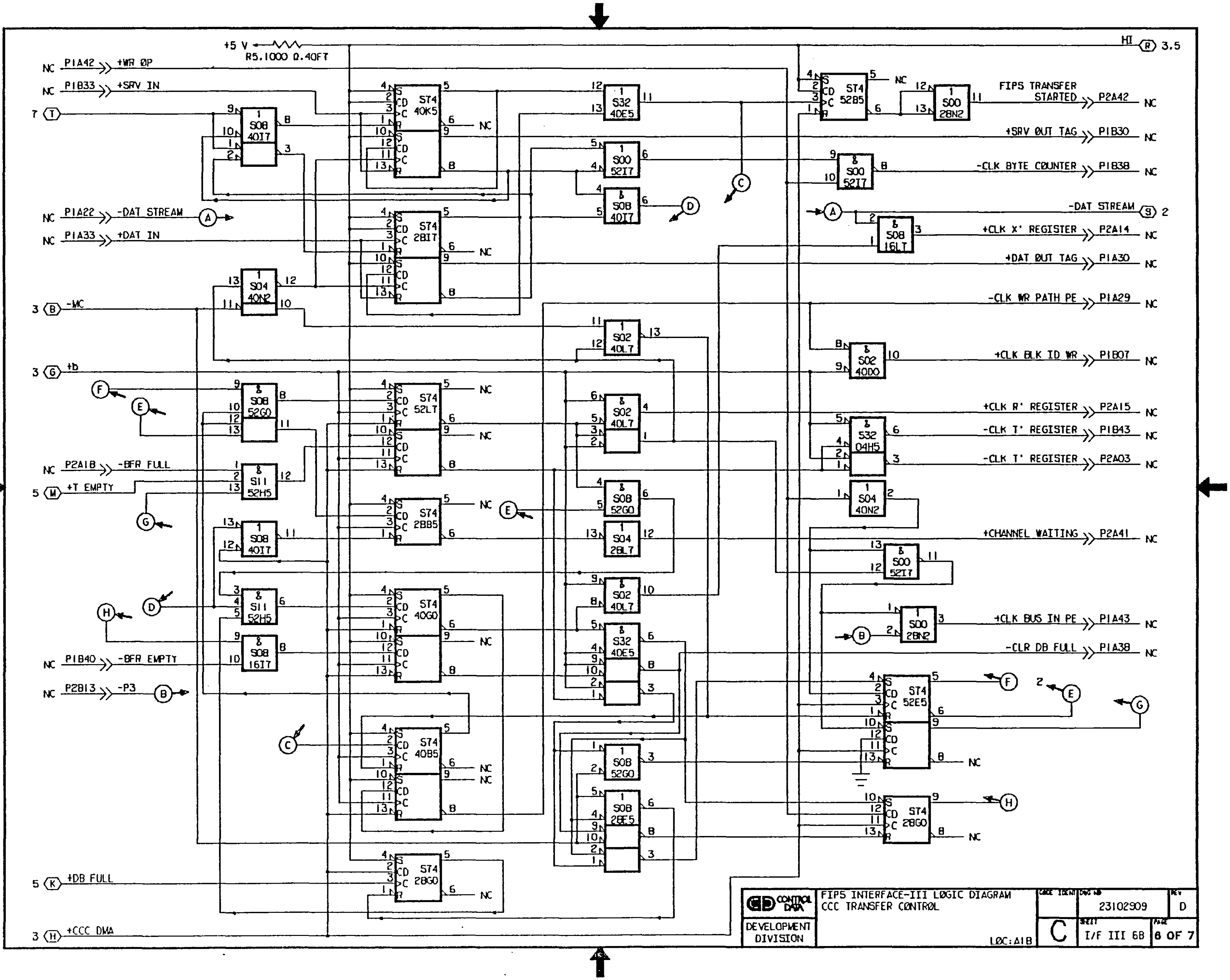
CODE IDENT | DWG NO 23102909 | REV D

C | SHEET I/F III 58 | PAGE 5 OF 7

FIPS INTERFACE - III (A18-6)

TRANSFER CONTROL CIRCUITS

The transfer control circuits are not used on this logic module. Transfer control is performed by logic module (A17-6).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
CCC TRANSFER CONTROL

LOC:A1B

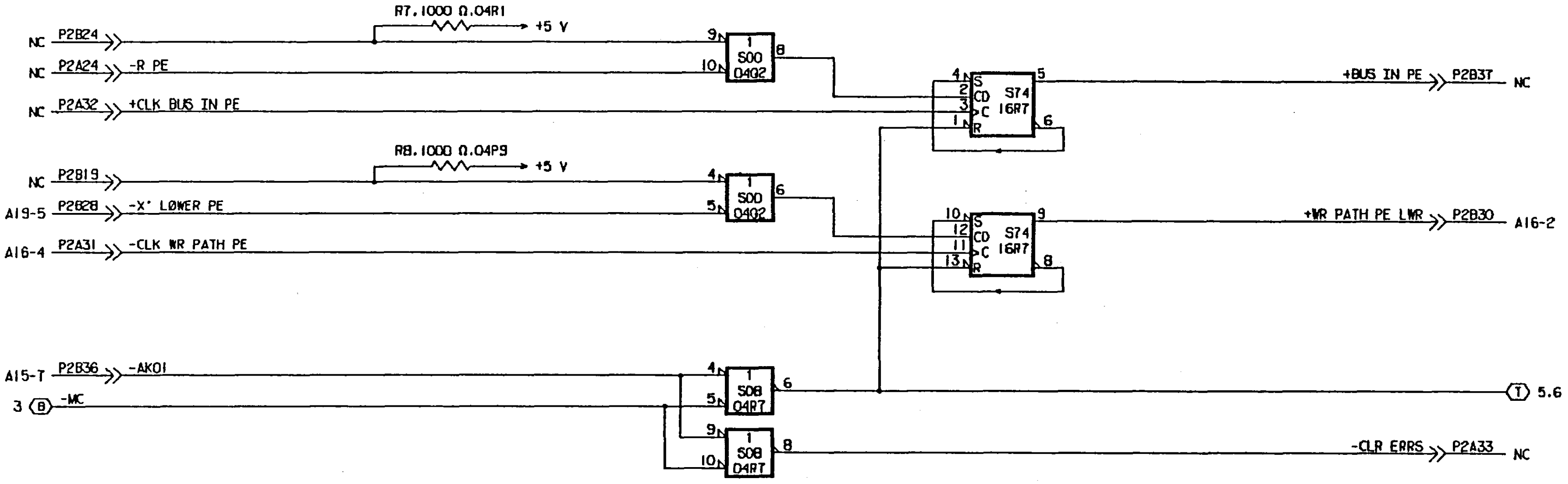
23102909

D

C

I/F III 6B

6 OF 7



CONTROL DATA	FIPS INTERFACE-III LOGIC DIAGRAM PARITY ERROR LATCHES	CODE IDENT	DWG NO 23102909	REV D
DEVELOPMENT DIVISION	LOC:A18	C	SHEET I/F III 7B	PAGE 7 OF 7

PAGE							REVISION RECORD					
7	6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	LBU
A	A	B	B	A	A	B	CA47300	SEE C.O.	MES	10/85	NZ	NZ
C	C	C	C	C	C	C	CA47702	INACTIVE, FOR SERVICE USE ONLY SUPERSEDED BY 53550867	MES	8/13/86	NS	NS
D	D	D	D	D	D	D	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/27/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE PLACE ANGLES
± ± ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	L.B. ULFIG	04/85
MFG	B.J. REILAND	04/85
APVD	L.B. ULFIG	04/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
FIPS I/F 3

PWA-53590794
PWB-23140955

SIZE C
FSCM NO. 34010
DWG NO. 23140956
LOC: A18
SHEET IF III IBR
PAGE 1 OF 7

FIPS INTERFACE - III (A18-2)

DATA BUS DRIVERS

During a coupler read operation, the lower 8-bit byte (bits T1 through T8) from the T register (A18-5) is sent from the drivers to the data bus on bidirectional pins. The 8-bit byte is then written into memory (A10-5).

DATA BUS RECEIVERS

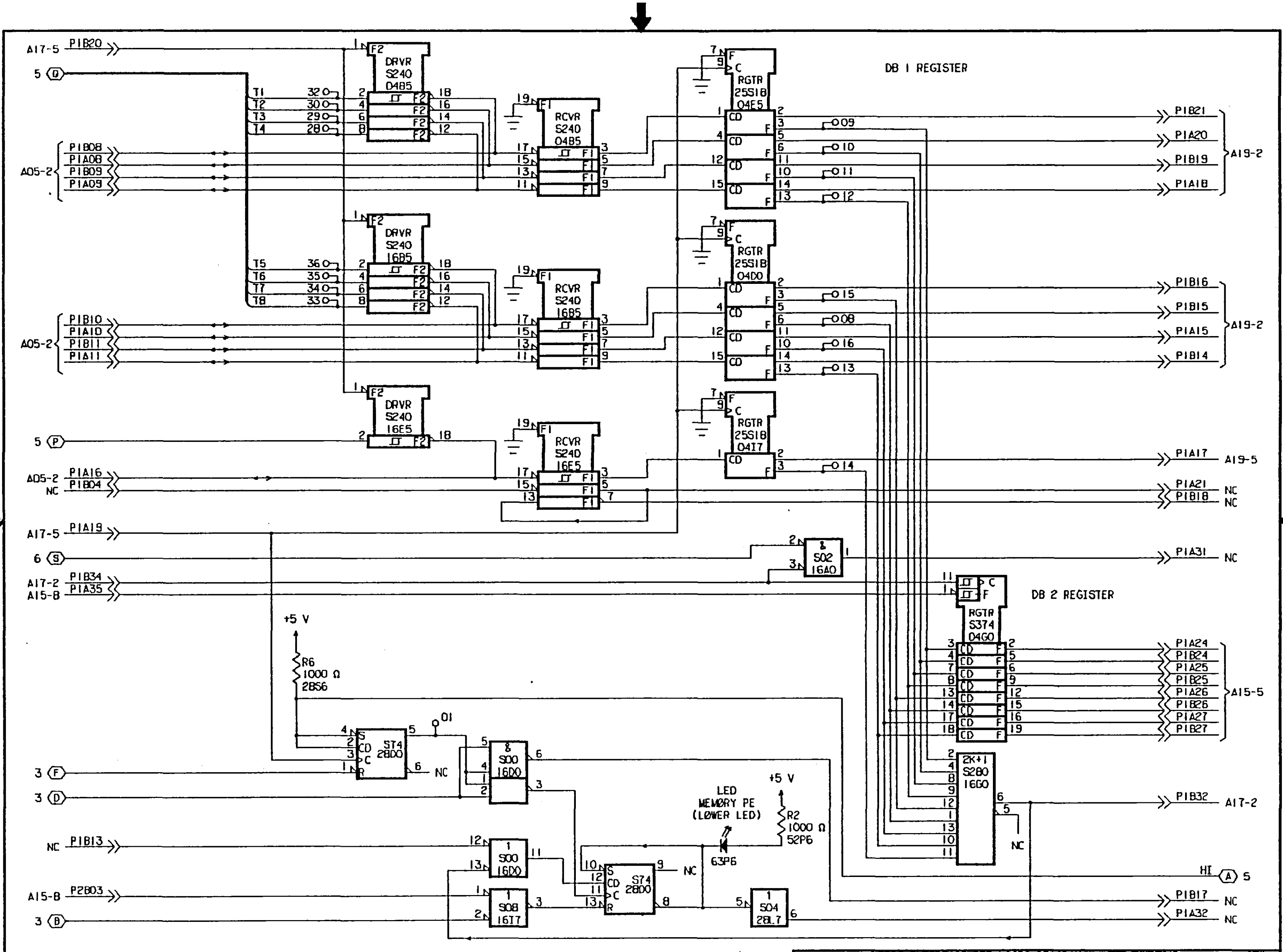
During a coupler write operation, the lower 8-bit byte (bits 08 through 15) is read from memory onto the data bus and sent to the receivers on the same bidirectional pins used by the data bus drivers. The receivers send the 8-bit byte to the DB1 register.

DATA BUS REGISTERS (DB1/DB2)

The lower data bus bytes from the data bus receivers are clocked into the DB1 register by the Clk DB1 Register signal from the memory control circuit (A17-5). This signal is also used to generate the Clk DB2 Register signal (A17-2) that clocks the lower data byte from the DB1 register into the DB2 register, to the data bus parity check circuit, and to the data byte compare circuit (A19-2). The lower data byte (bits IB08 through IB15) is sent from the DB2 register to the I bus.

DATA BUS PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the lower data bus byte and associated parity bit. The memory parity error LED lights if an error occurs in transmission of the lower data bus byte.



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
DATA BUS RECEIVER/DRIVERS
DB 1 REGISTER. DB 2 REGISTER

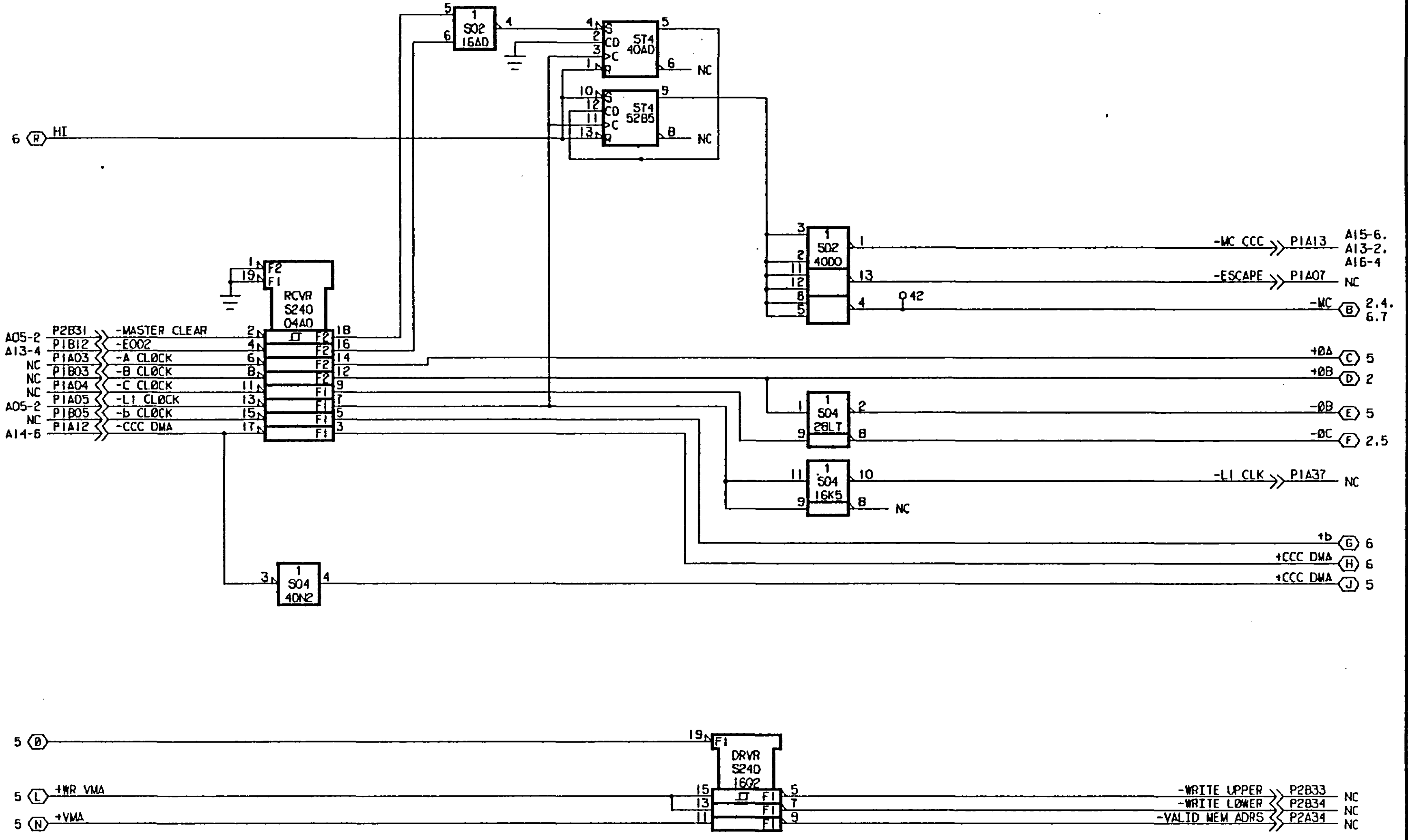
LOC:A18

CODE IDENT	DWG NO	REV
C	23140956	D
	SHEET I/F III 2BR	PAGE 2 OF 7

FIPS INTERFACE - III (A18-3)

DATA BUS RECEIVERS/DRIVERS

Various clocks and signals including bus master clear are received from the data bus. The data bus drivers on this logic module are not used.



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
DATA BUS RECEIVERS/DRIVERS

LOC:A18

CODE IDENT	DWG NO	REV
C	23140956	D
	SHEET I/F III 3BR	PAGE 3 OF 7

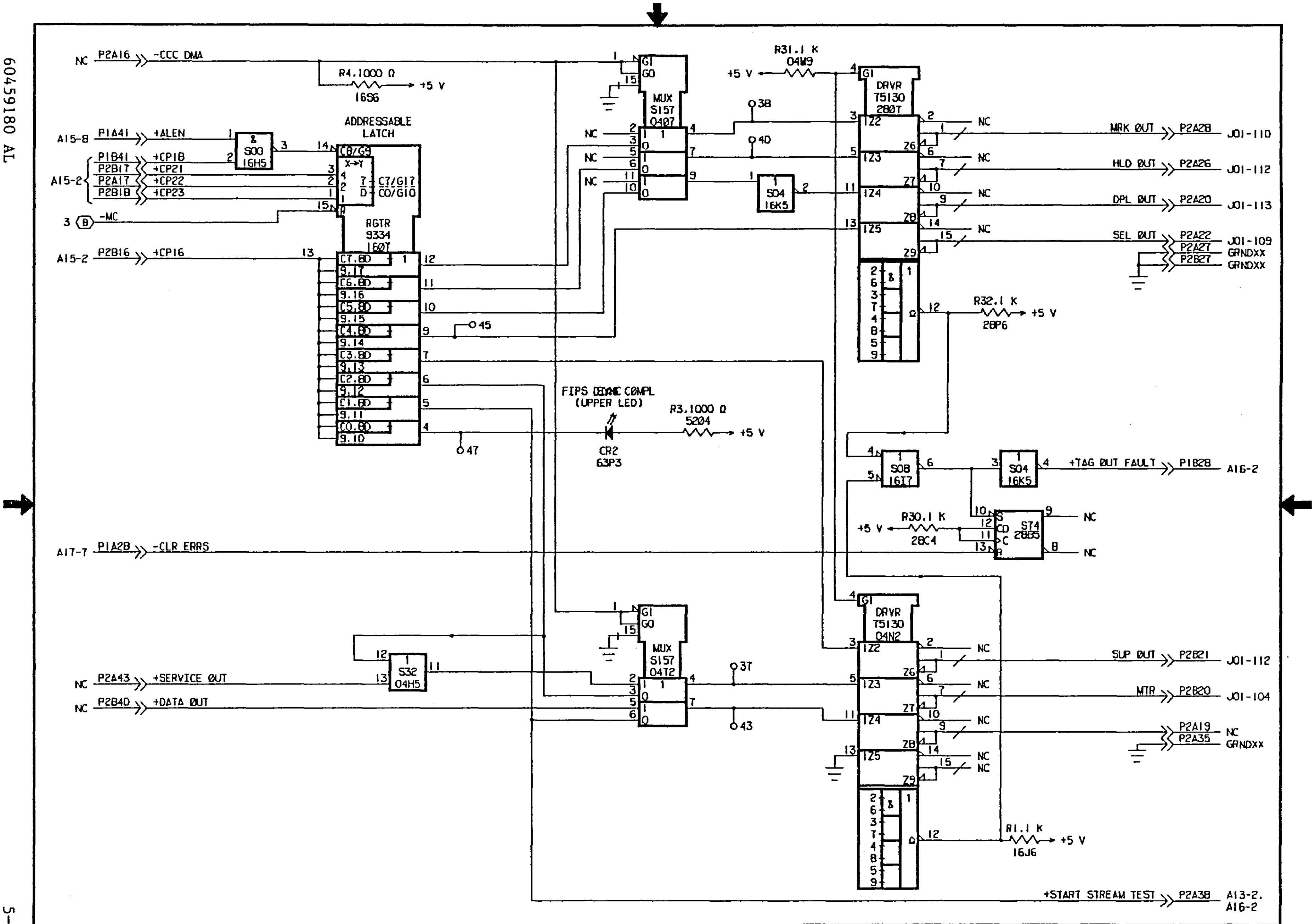
FIPS INTERFACE - III (A18-4)

ADDRESSABLE LATCH REGISTER

The outputs of this register are selected by microcode bits CP18, CP21, CP22, and CP23 from the FIPS interface UDI sequencer (A15-2). The register outputs are sent through the multiplexer circuits to the tag transmitters. The FIPS diagnostic complete LED indicator lights when the internal FIPS interface diagnostic starts running and goes out upon successful completion of the diagnostic test. The indicator remains lit if an error is detected.

TAG TRANSMITTERS

These circuits transmit signals on the tag lines to the external FIPS device. The tag lines control information that is present on the bus out lines (A19-5).



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
TAG TRANSMITTERS

LØC:A18

CODE IDENT	DWG NO	REV
C	23140956	D
SHEET	I/F III 4BR	PAGE 4 OF 7

FIPS INTERFACE - III (A18-5)

T REGISTER

The lower 8-bit byte of assembly/disassembly information (bits AD08 through AD15) is clocked into the T register during a UDI read operation. The read data bits (T1 through T8) in the T register are then sent to the data bus drivers (A18-2) and to the parity generator.

T′ REGISTER

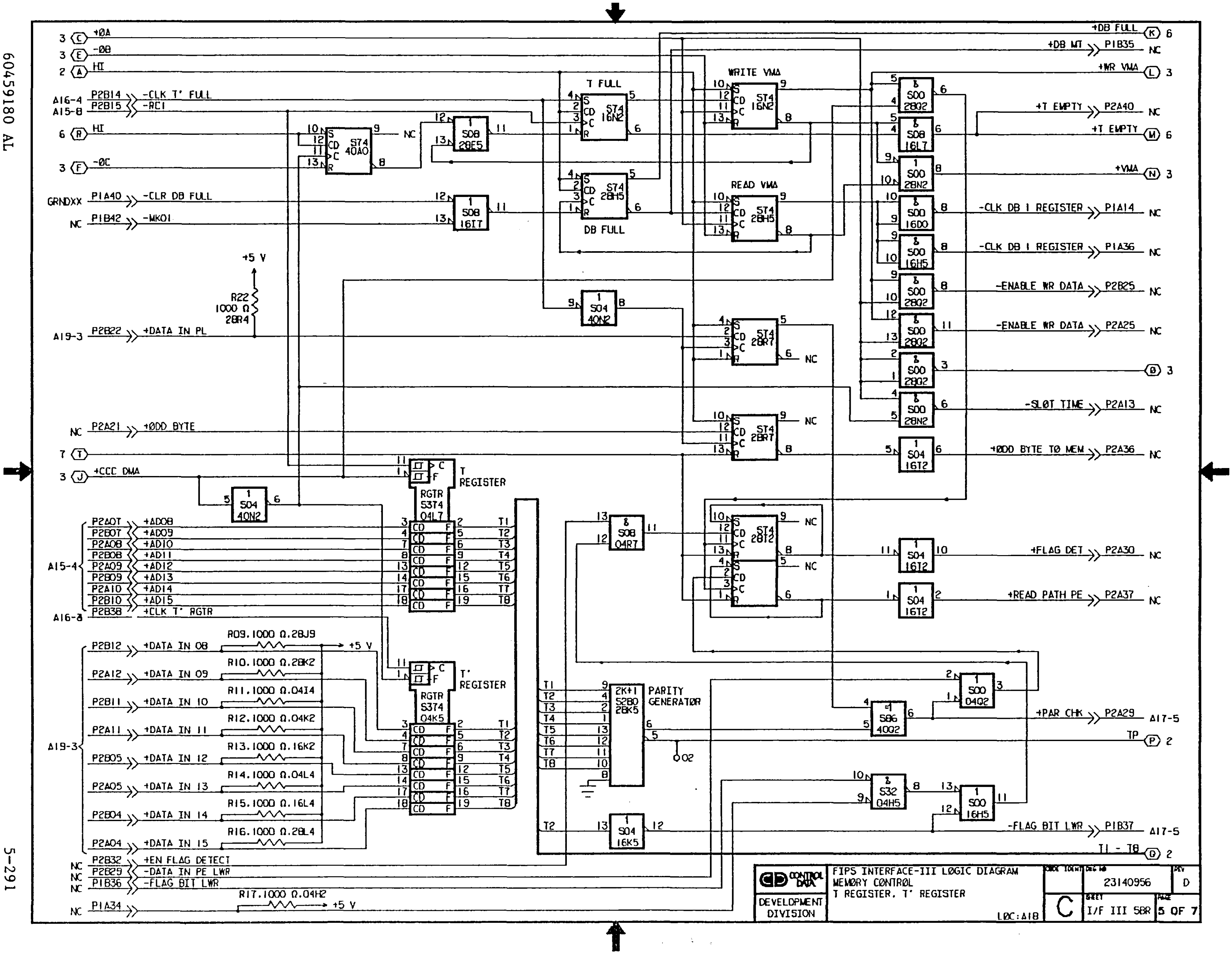
The lower 8-bit byte of data bus information (data-in bits 08 through 15) is clocked into the T′ register during a DMA read operation. The read data bits (T1 through T8) are sent to the parity generator (A18-5) and to the data bus drivers (A18-2).

PARITY GENERATION

A parity bit is generated on the data from the T or T′ register. This parity bit (TP) is sent to the data bus driver (A17-2) along with the read data bits (T1 through T8). The parity generator also sends a parity bit to the parity check circuit (A17-5).

FLAG BIT

This bit is used to detect illegal 6-bit codes read from the code conversion read RAM (A19-3).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III L0GIC DIAGRAM
MEM0RY C0NTR0L
T REGISTER, T' REGISTER

L0C:A18

DWG NO 23140956

REV D

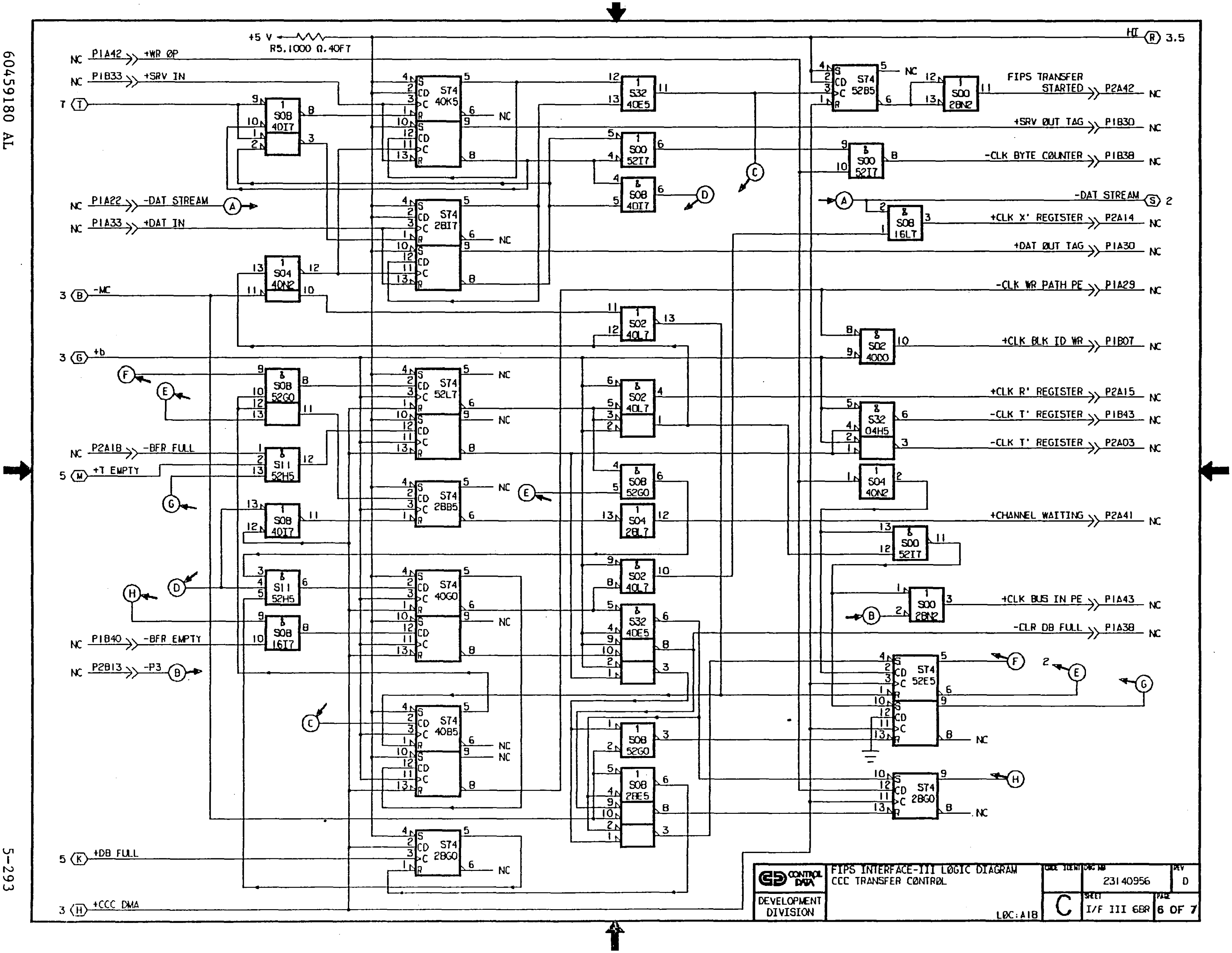
C

SHEET I/F III 5BR

PAGE 5 OF 7

TRANSFER CONTROL CIRCUITS

The transfer control circuits are not used on this logic module. Transfer control is performed by logic module (A17-6).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
CCC TRANSFER CØNTRØL

LØC: A18

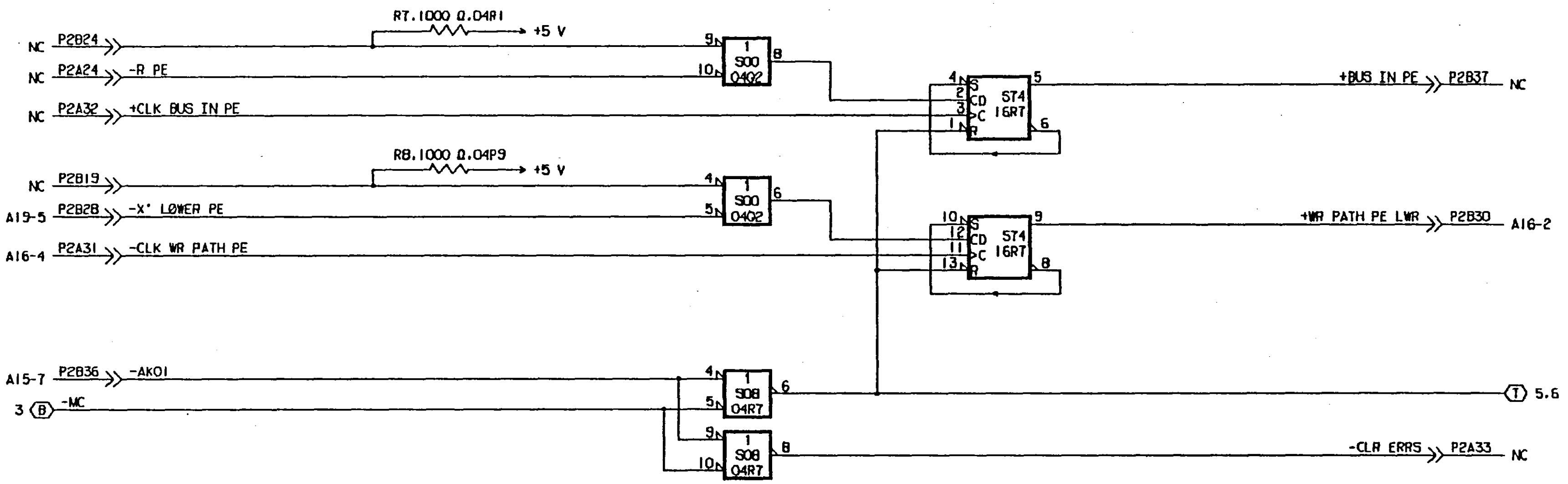
CODE IDENT
C

DWG NO
23140956

REV
D

SHEET
I/F III 6BR

PAGE
6 OF 7



CONTROL DATA	FIPS INTERFACE-III LOGIC DIAGRAM PARITY ERROR LATCHES	CAGE IDENT	DWG NO 23140956	REV D
DEVELOPMENT DIVISION	LOC:A1B	C	SHEET I/F III 7BR	PAGE 7 OF 7

PAGE							REVISION RECORD					
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A	A	A	A	A	A	A		CLASS A RELEASED	EFA	12/85	NZ	RTH
B	B	B	B	B	B	B	CA47702	SEE NOTE 4	WES	8/13/86	NS	NS
C	C	C	C	C	C	C	CA48239	ADDED COVER, RE-INTERSHEET	WES	1/28/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	E F ARLANDSON	12/85
CHKD	N ZAK	12/85
ENGR	R T HENNING	02/86
MFG	B J REILAND	02/86
APVD	R T HENNING	02/86

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
FIPS I/F 3

PWA-53590866
PWB-53590867

SIZE C
FSCM NO. 34010
DWG NO. 53590868
LOC: A1B
SHEET IF III 1-BF
PAGE 1 OF 7

FIPS INTERFACE - III (A18-2)

DATA BUS DRIVERS

During a coupler read operation, the lower 8-bit byte (bits T1 through T8) from the T register (A18-5) is sent from the drivers to the data bus on bidirectional pins. The 8-bit byte is then written into memory (A10-5).

DATA BUS RECEIVERS

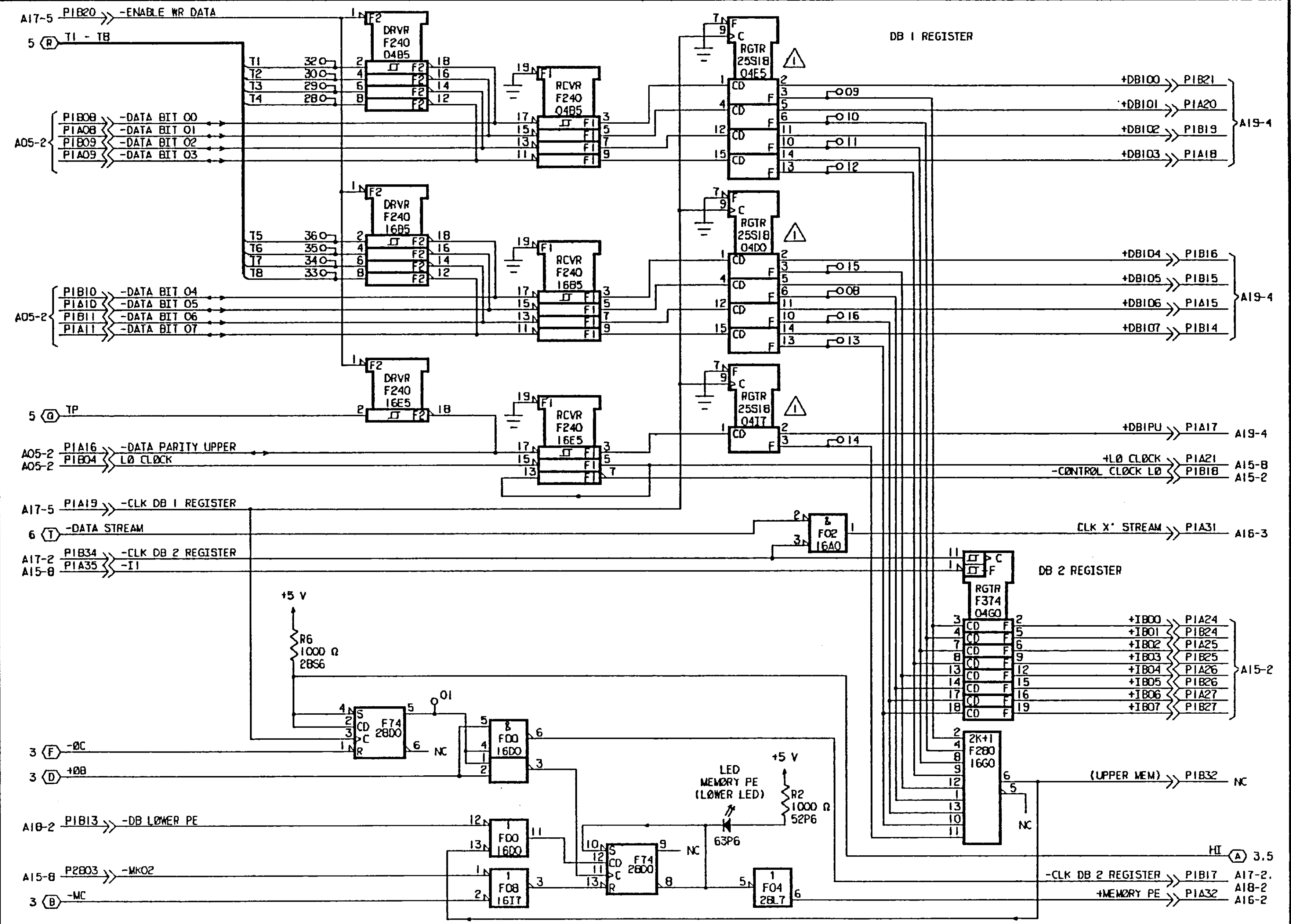
During a coupler write operation, the lower 8-bit byte (bits 08 through 15) is read from memory onto the data bus and sent to the receivers on the same bidirectional pins used by the data bus drivers. The receivers send the 8-bit byte to the DB1 register.

DATA BUS REGISTERS (DB1/DB2)

The lower data bus bytes from the data bus receivers are clocked into the DB1 register by the Clk DB1 Register signal from the memory control circuit (A17-5). This signal is also used to generate the Clk DB2 Register signal (A17-2) that clocks the lower data byte from the DB1 register into the DB2 register, to the data bus parity check circuit, and to the data byte compare circuit (A19-2). The lower data byte (bits IB08 through IB15) is sent from the DB2 register to the I bus.

DATA BUS PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the lower data bus byte and associated parity bit. The memory parity error LED lights if an error occurs in transmission of the lower data bus byte.



NOTES:

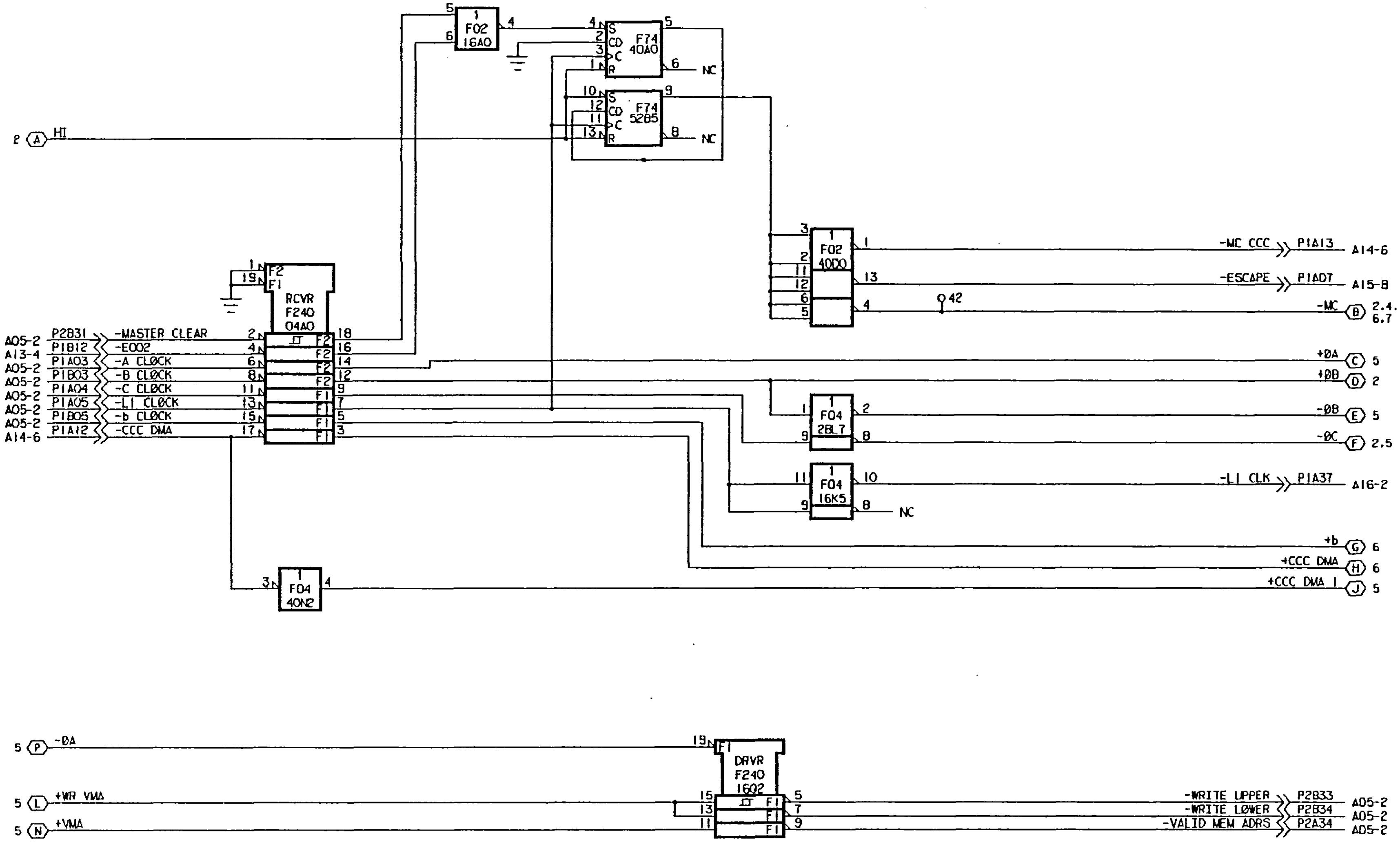
⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590866.

CONTROL DATA DEVELOPMENT DIVISION	FIPS INTERFACE-III LOGIC DIAGRAM DATA BUS RECEIVER/DRIVERS DB 1 REGISTER. DB 2 REGISTER LOC:A18	CODE IDENT C	DWG NO 53590868 SHEET I/F III 2-BF	REV C PAGE 2 OF 7

FIPS INTERFACE - III (A18-3)

DATA BUS RECEIVERS/DRIVERS

Various clocks and signals including bus master clear are received from the data bus. The data bus drivers on this logic module are not used.



CONTROL DATA	FIPS INTERFACE-III LØGIC DIAGRAM DATA BUS RECEIVERS/DRIVERS	CODE IDENT	DWG NO 53590868	REV C
DEVELOPMENT DIVISION	LØC:A1B	C	SHEET I/F III 3-BF	PAGE 3 OF 7

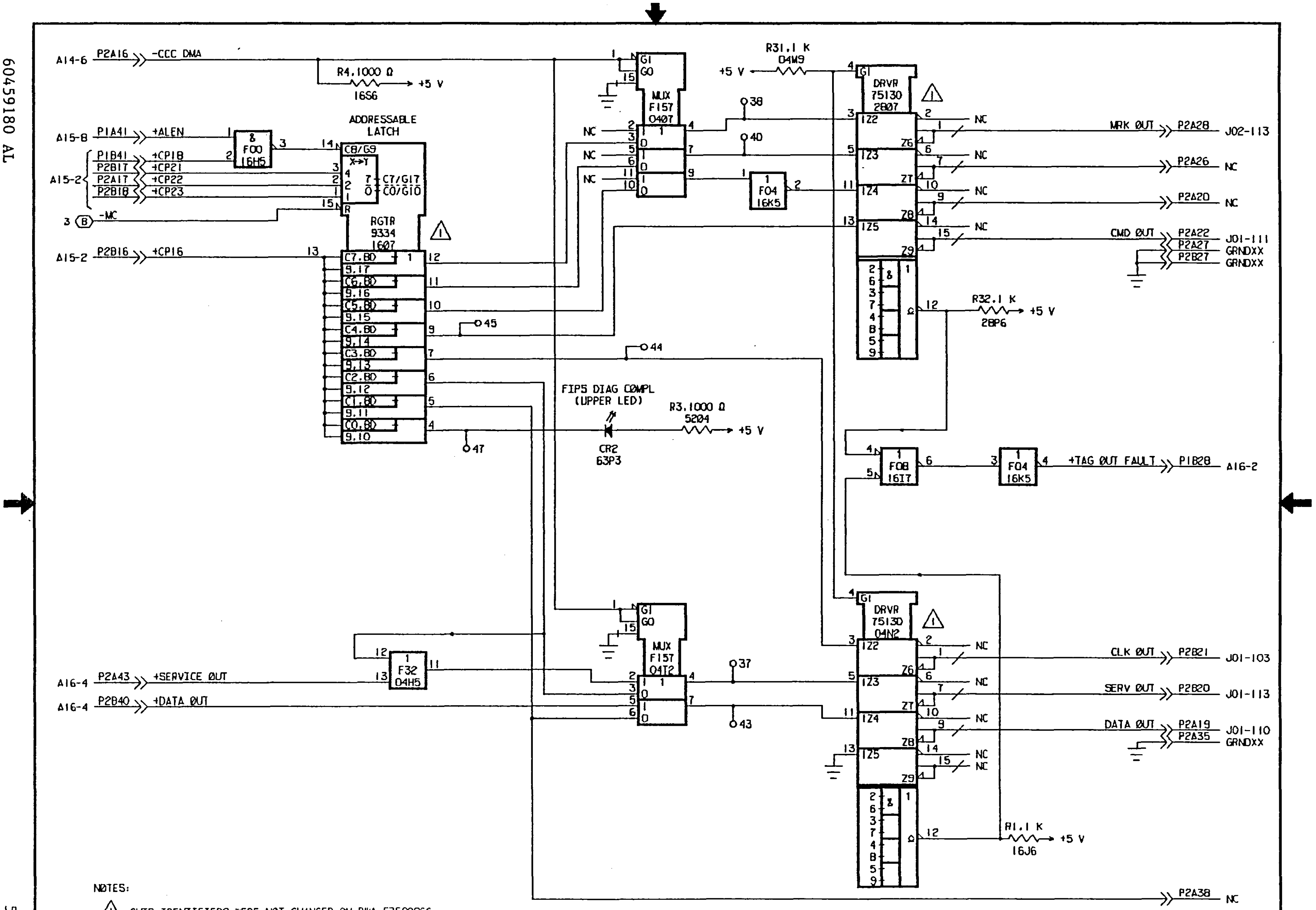
FIPS INTERFACE - III (A18-4)

ADDRESSABLE LATCH REGISTER

The outputs of this register are selected by microcode bits CP18, CP21, CP22, and CP23 from the FIPS interface UDI sequencer (A15-2). The register outputs are sent through the multiplexer circuits to the tag transmitters. The FIPS diagnostic complete LED indicator lights when the internal FIPS interface diagnostic starts running and goes out upon successful completion of the diagnostic test. The indicator remains lit if an error is detected.

TAG TRANSMITTERS

These circuits transmit signals on the tag lines to the external FIPS device. The tag lines control information that is present on the bus out lines (A19-5).



NOTES:

⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590866.

CONTROL DATA	FIPS INTERFACE-III LOGIC DIAGRAM TAG TRANSMITTERS	CODE IDENT	DWG NO 53590868	REV C
DEVELOPMENT DIVISION	LOC: A1B	C	SHEET I/F III 4-BF	PAGE 4 OF 7

FIPS INTERFACE - III (A18-5)

T REGISTER

The lower 8-bit byte of assembly/disassembly information (bits AD08 through AD15) is clocked into the T register during a UDI read operation. The read data bits (T1 through T8) in the T register are then sent to the data bus drivers (A18-2) and to the parity generator.

T´ REGISTER

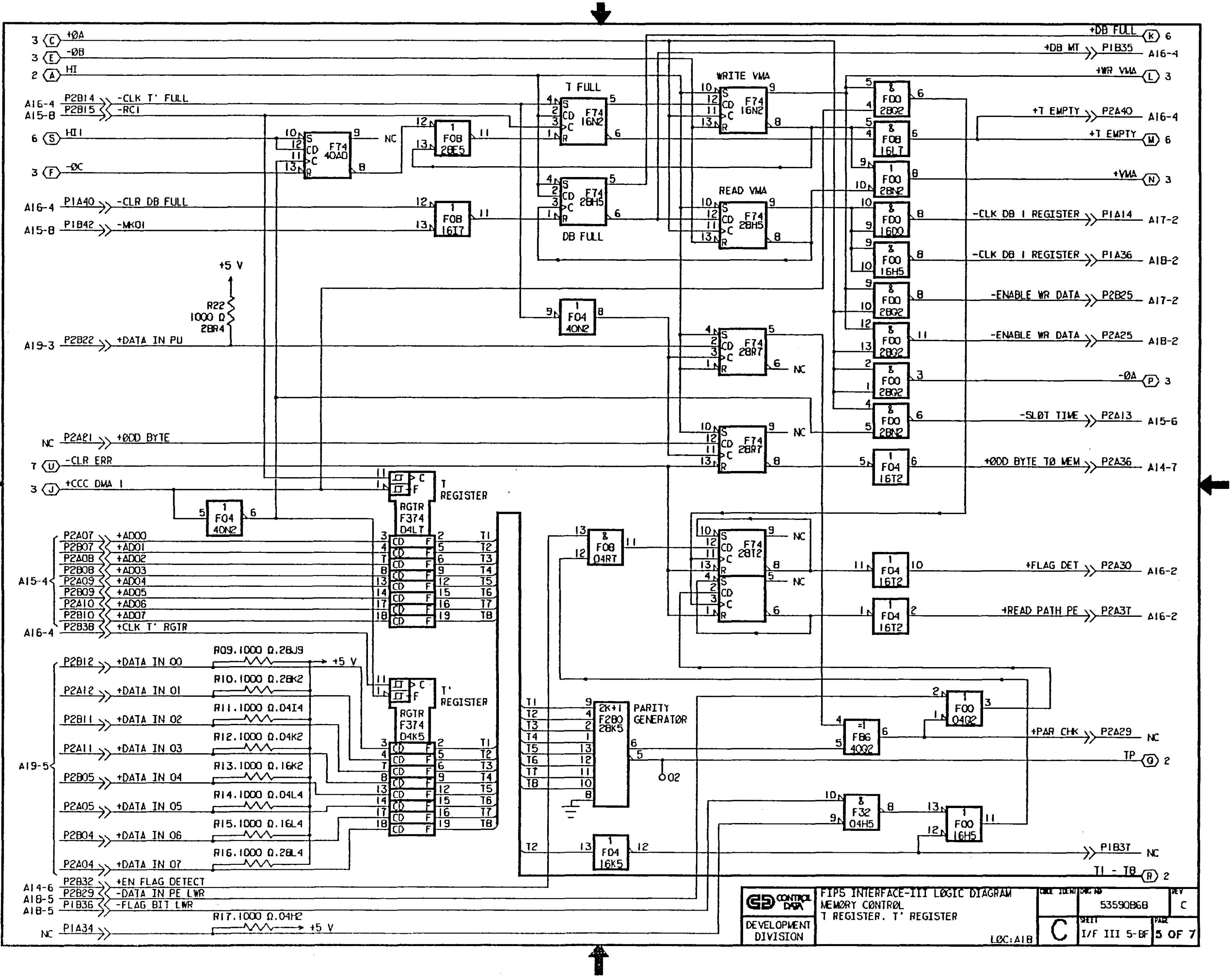
The lower 8-bit byte of data bus information (data-in bits 08 through 15) is clocked into the T´ register during a DMA read operation. The read data bits (T1 through T8) are sent to the parity generator (A18-5) and to the data bus drivers (A18-2).

PARITY GENERATION

A parity bit is generated on the data from the T or T´ register. This parity bit (TP) is sent to the data bus driver (A17-2) along with the read data bits (T1 through T8). The parity generator also sends a parity bit to the parity check circuit (A17-2).

FLAG BIT

This bit is used to detect illegal 6-bit codes read from the code conversion read RAM (A19-3).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LOGIC DIAGRAM
MEMORY CONTROL
T REGISTER, T' REGISTER

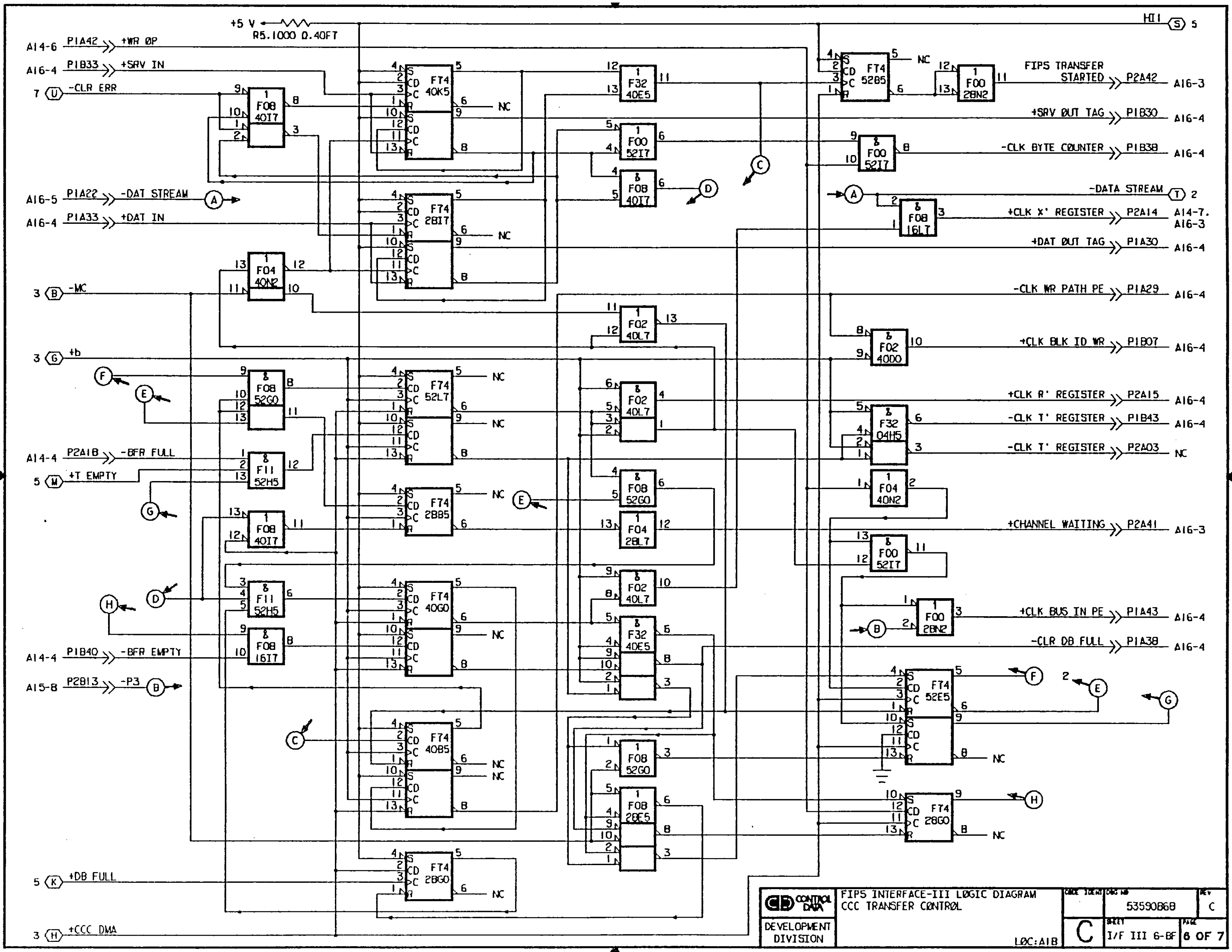
LOC:A18

CODE IDENT	DWG NO	REV
	53590868	C
C	SHEET I/F III 5-8F	PAGE 5 OF 7

FIPS INTERFACE - III (A18-6)

TRANSFER CONTROL CIRCUITS

The transfer control circuits are not used on this logic module. Transfer control is performed by logic module (A17-6).



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
CCC TRANSFER CØNTRØL

LØC:A18

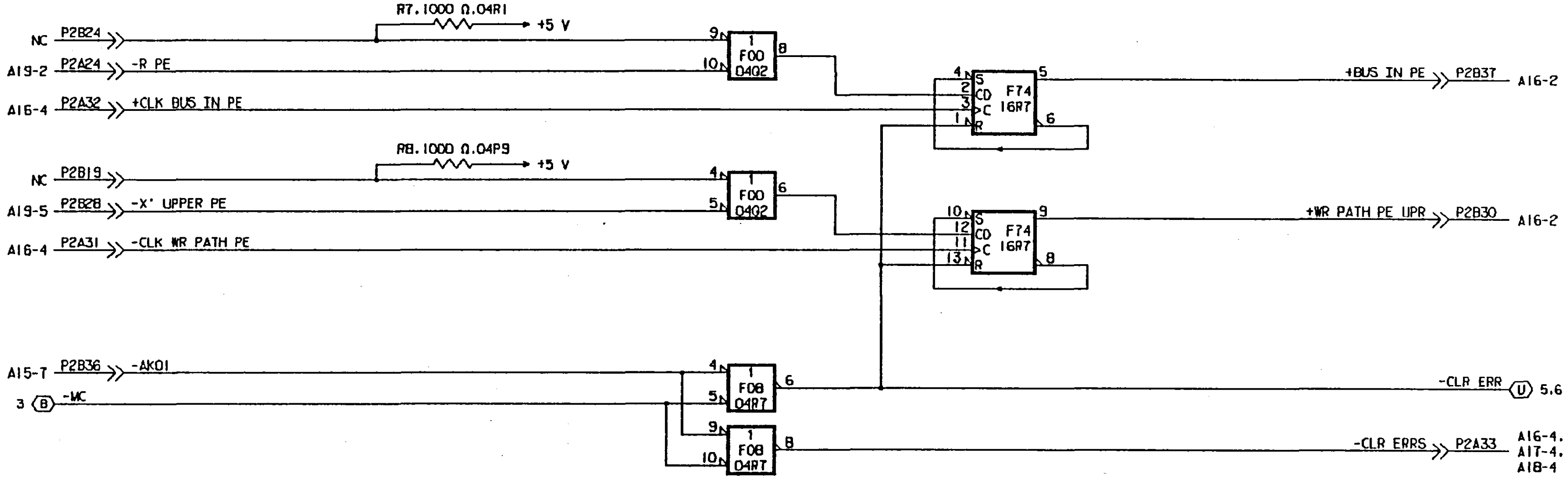
CODE IDENT C

DWG NO 53590868

REV C

SHEET I/F III 6-BF

PAGE 6 OF 7



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-III LØGIC DIAGRAM
PARITY ERRØR LATCHES

LØC:A18

CODE IDENT

DWG NO 53590868

REV C

SIZE C

SHEET I/F III 7-BF

PAGE 7 OF 7

PAGE						REVISION RECORD					
6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	LBU
A	B	A	A	A	B	CA47357	SEE C.O.	MES	10/85	NZ	NZ
C	C	C	C	C	C	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/27/87	NS	NS

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DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	L.B. ULFIG	03/85
MFG	B.J. REILAND	03/85
APVD	L.B. ULFIG	03/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
FIPS I/F 4

PWA-22194396
PWB-24670929

SIZE C
FSCM NO. 34010
DWG NO. 23102910
LOC: A19
SHEET IF IV 1
PAGE 1 OF 6

FIPS INTERFACE - IV (A19-2)

BUS IN

Bus-in bits 0 through 7 carry read data or status information from the tape or disk device to the coupler. The bus-in receivers route the bus-in information to the R register, the parity check circuit, the code conversion read RAM (A19-3), and the block ID generator multiplexer (A19-6).

PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the eight bus-in bits and associated parity bit. A bus-in parity error is sent to the control flag register (A17-7, A16-2) if an error occurs during transmission of bus-in data from the tape or disk device.

R REGISTER

The bus-in bits are clocked into the R register by the -P3 clock from the FIPS interface UDI (A15-8). The bus-in bits are then sent from the R register to the data byte compare circuit and the I bus multiplexer.

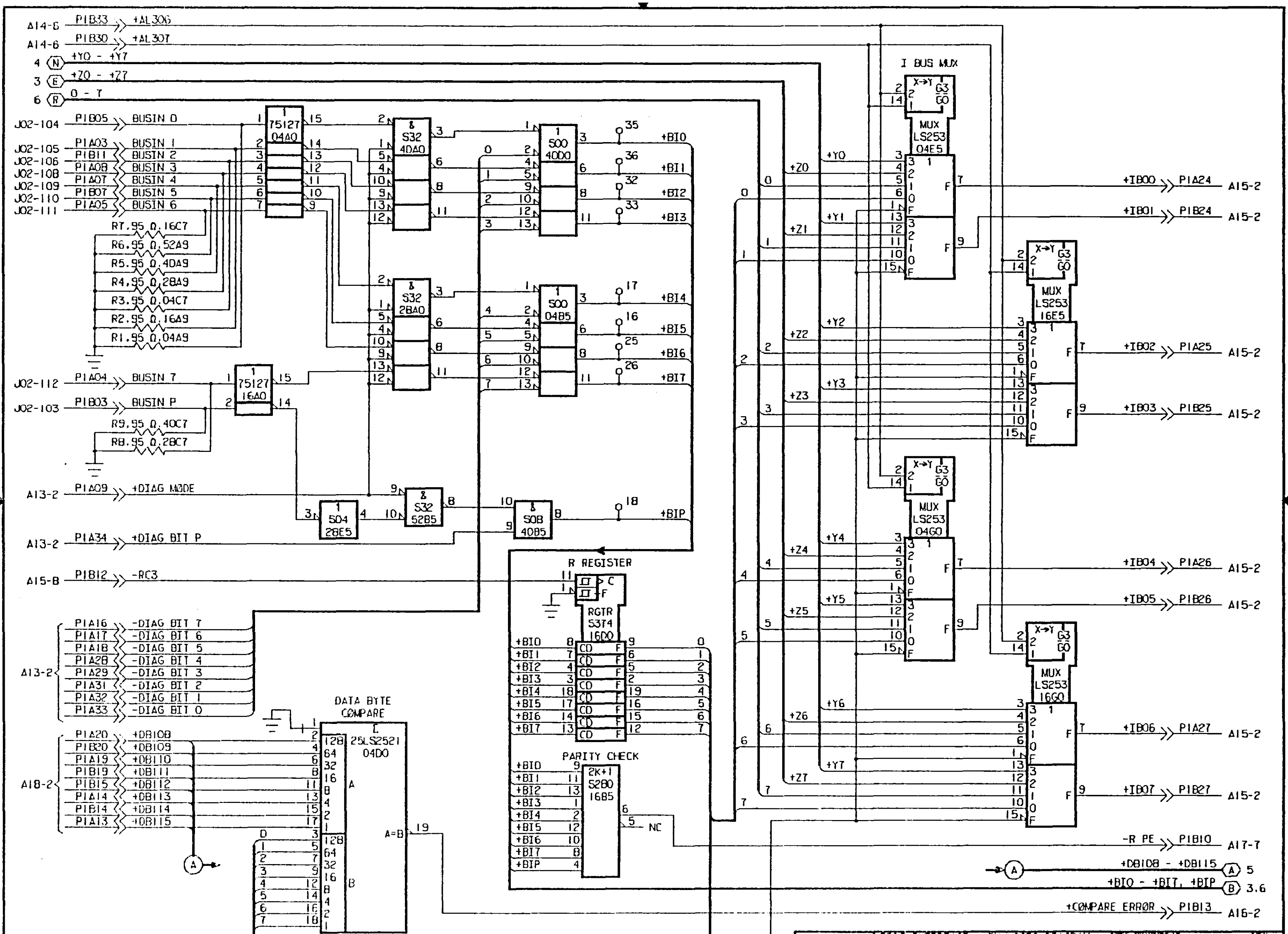
DATA BYTE COMPARE CIRCUIT

The data byte compare circuit compares the expected bus-in byte (bits DB108 through DB115) with the last actual bus-in byte (bits BI0 through BI7) received by the R register. A compare error is sent to the control flag register (A16-2) if the bytes are not identical.

I BUS MUX

Addressable latch bits AL306 and AL307 form a code to enable the multiplexer to gate the following information to the I bus.

AL306	AL307	I-Bus Information
0	0	R register (bits BI0 through BI7)
0	1	Block ID (bits 0 through 7)
1	0	Read conversion memory (bits Z0 through Z7)
1	1	Write conversion memory (bits Y0 through Y7)



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
BUS IN RECEIVERS
R' REGISTER, I BUS MUX
LOC:A19

CODE IDENT	DWG NO	REV
	23102910	C
C	SHEET I/F IV 2	PAGE 2 OF 6

FIPS INTERFACE - IV (A19-3)

LOAD CODE

When the processor selects a load code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for loading conversion codes (bits B00 through B07) into the RAM.

COPY CODE

When the processor selects a read (copy) code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for reading the conversion codes from the code conversion read RAM and transferring them to the R′ register.

CODE CONVERSION READ OPERATION

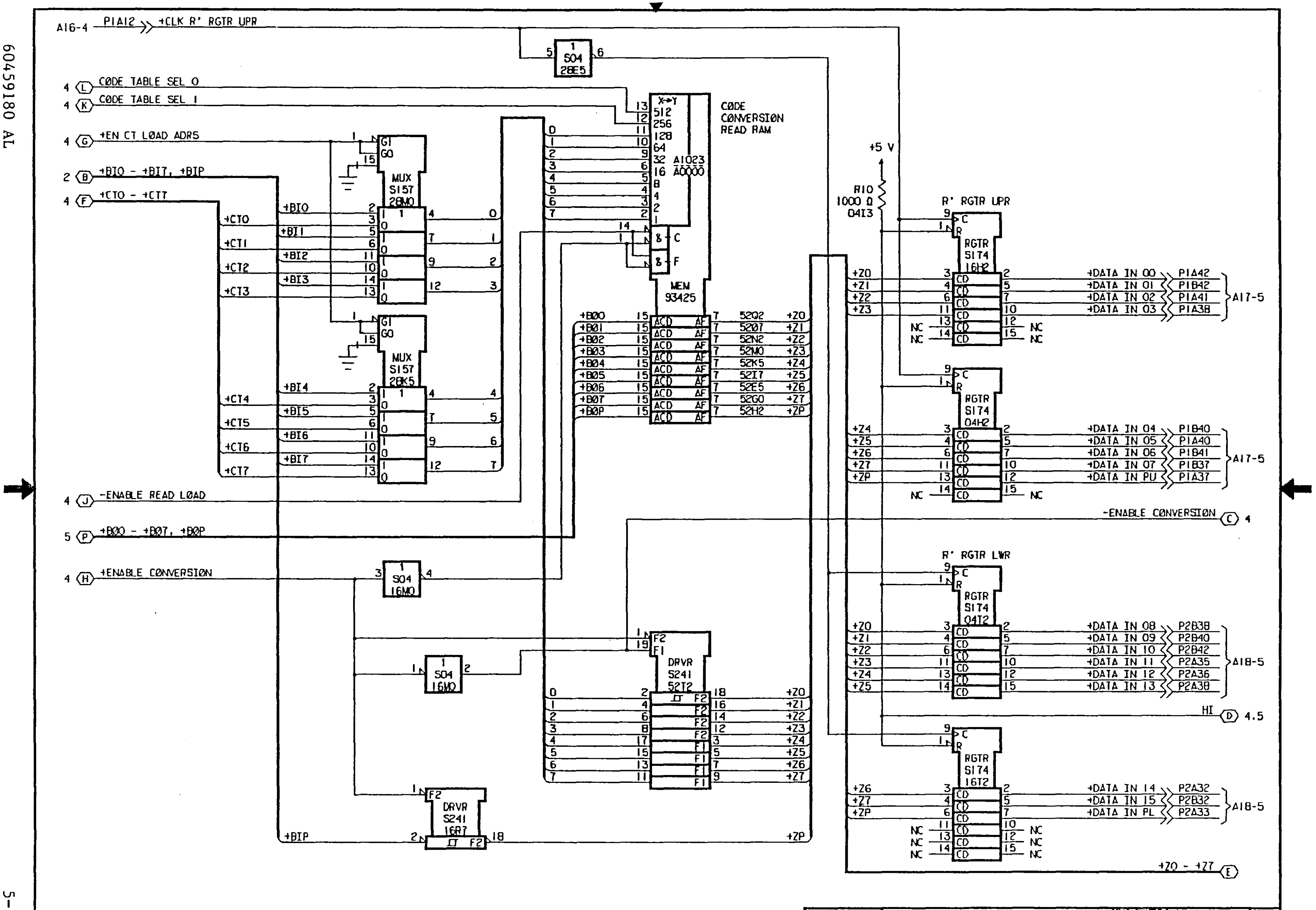
When data is read with code conversion, the data character (bits BI0 through BI7) from the tape device is used as an address to read its corresponding conversion code from the code conversion read RAM. This coded character is eventually sent to the CYBER channel in place of the tape device data character.

When data is read with code conversion disabled, bus-in bits BI0 through BI7 are gated through the driver and bypass the code conversion read RAM.

CODE TABLE SELECT

The code table select signals form a code to select one of four tables in the code conversion read RAM as follows:

Code Table Sel 0	Code Table Sel 1	Table
0	0	1
0	1	2
1	0	3
1	1	4



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
READ CODE CONVERSION
R' REGISTER

LOC:A19

DWG NO 23102910

REV C

C

SHEET I/F IV 3

PAGE 3 OF 6

LOAD CODE

When the processor selects a load code write table operation, assembly/disassembly bits AD00 through AD07 are clocked through the address counter (bits CT0 through CT7), gated through the multiplexer, and sent to the code conversion write RAM. These bits provide the addresses for loading conversion codes (bits B00 through B07) into the RAM. The address counter increments by one each time a conversion code is entered.

COPY CODE

When the processor selects a read (copy) code write table operation, assembly/disassembly bits AD00 through AD07 are clocked through the address counter (bits CT0 through CT7), gated through the multiplexer, and sent to the code conversion write RAM. These bits provide the address for reading the conversion codes from the RAM. The address counter increments by one each time a conversion code is read.

CODE CONVERSION WRITE OPERATION

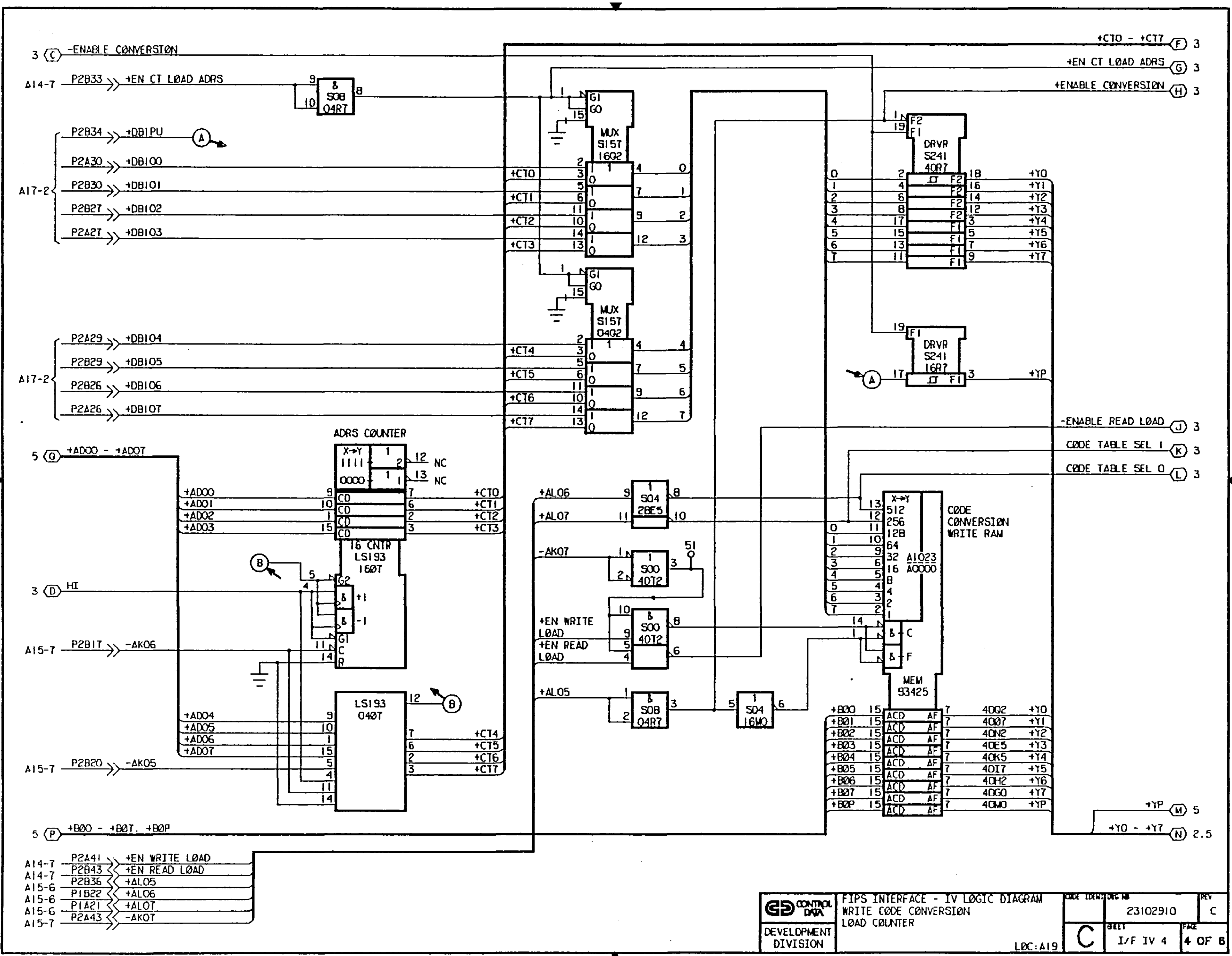
When data is written with code conversion, the data character (bits DB100 through DB107) from the CYBER channel is used as an address to read its corresponding conversion code from the code conversion write RAM. This coded character is eventually sent to the tape device in place of the CYBER channel data character.

When data is written with code conversion disabled, data bus bits DB100 through DB107 are gated through the driver and bypass the code conversion write RAM.

CODE TABLE SELECT

The code table select signals form a code to select one of four tables in the code conversion write RAM as follows:

Code Table Sel 0	Code Table Sel 1	Table
0	0	1
0	1	2
1	0	3
1	1	4



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
WRITE CODE CONVERSION
LOAD COUNTER

LOC: A19

CODE IDENT

DWG NO 23102910

REV C

C

SHEET I/F IV 4

PAGE 4 OF 6

FIPS INTERFACE - IV (A19-5)

X′ REGISTER

Data bus information (bits Y0 through Y7) is clocked into the X′ register during a direct memory access (DMA) write operation. The write data bits (B00 through B07) from the X′ register are then sent to the FIPS device on the bus-out lines. The X′ register bits are also sent to the parity generator (A19-5) and to the block ID generator (A19-6).

X REGISTER

Assembly/disassembly information (bits AD00 through AD07) is clocked into the X register during a universal device interface (UDI) write operation. The write data bits (B00 through B07) from the X register are then written into the code conversion read RAM (A19-3) or code conversion write RAM (A19-4) during a load conversion code operation or sent directly to the FIPS device on the bus-out lines during a normal write operation.

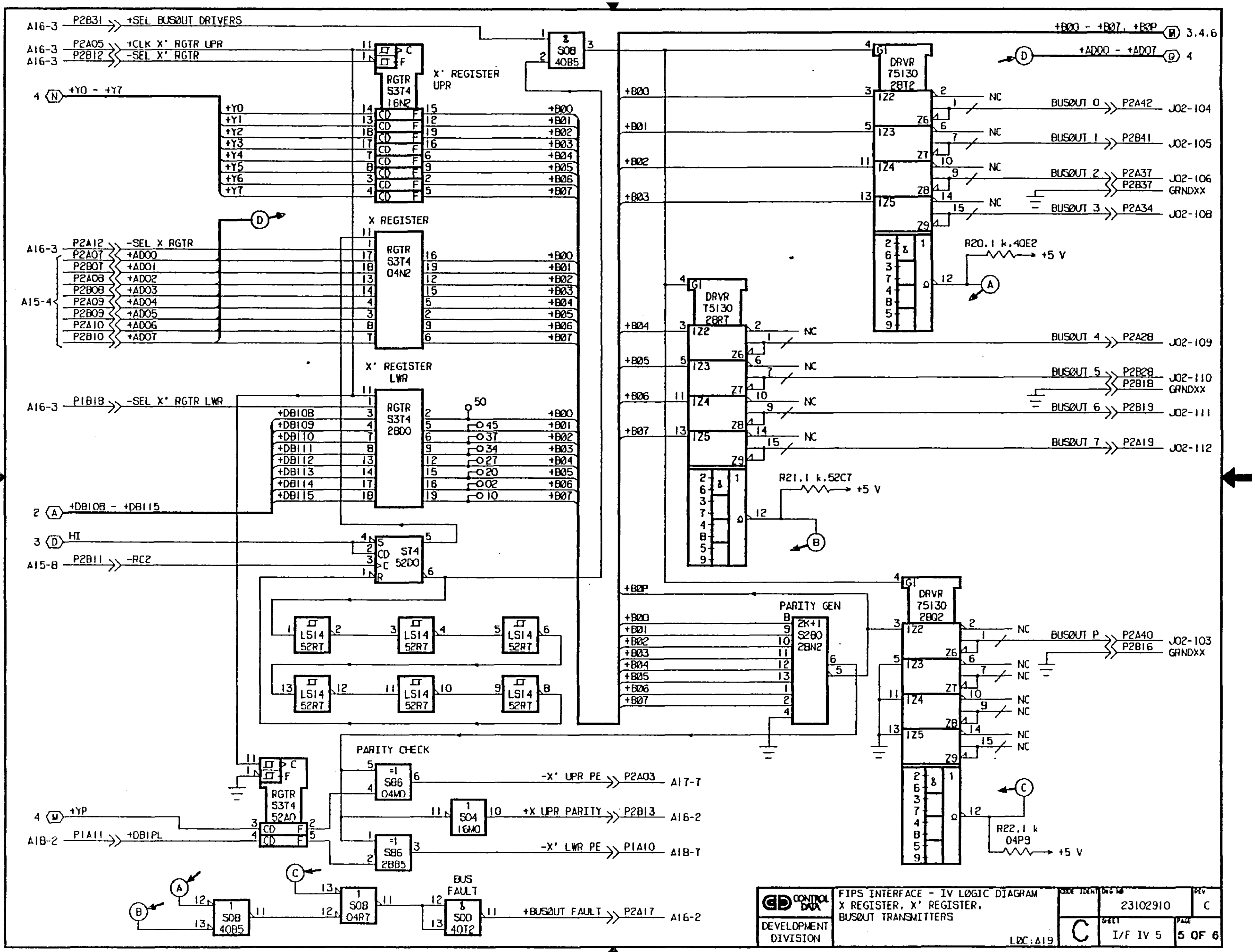
The X register bits are also sent to the parity generator (A19-5) and the block ID generator (A19-6).

PARITY GENERATION

A parity bit is generated on data from either the X′ register or the X register. The parity bit is sent to the external FIPS device on the Busout P line, to the control flag register (A16-2), and to the parity check circuit (A19-5).

PARITY CHECK CIRCUIT

This circuit compares the DMA write data parity bit (YP) with the parity bit generated from the DMA write data after it passes through the X′ register. A write path parity error is sent to the control flag register (A16-2) if an error occurs in transmission of DMA write data.



FIPS INTERFACE - IV LØGIC DIAGRAM
X REGISTER, X' REGISTER,
BUSØUT TRANSMITTERS

CONTROL DATA
DEVELOPMENT DIVISION

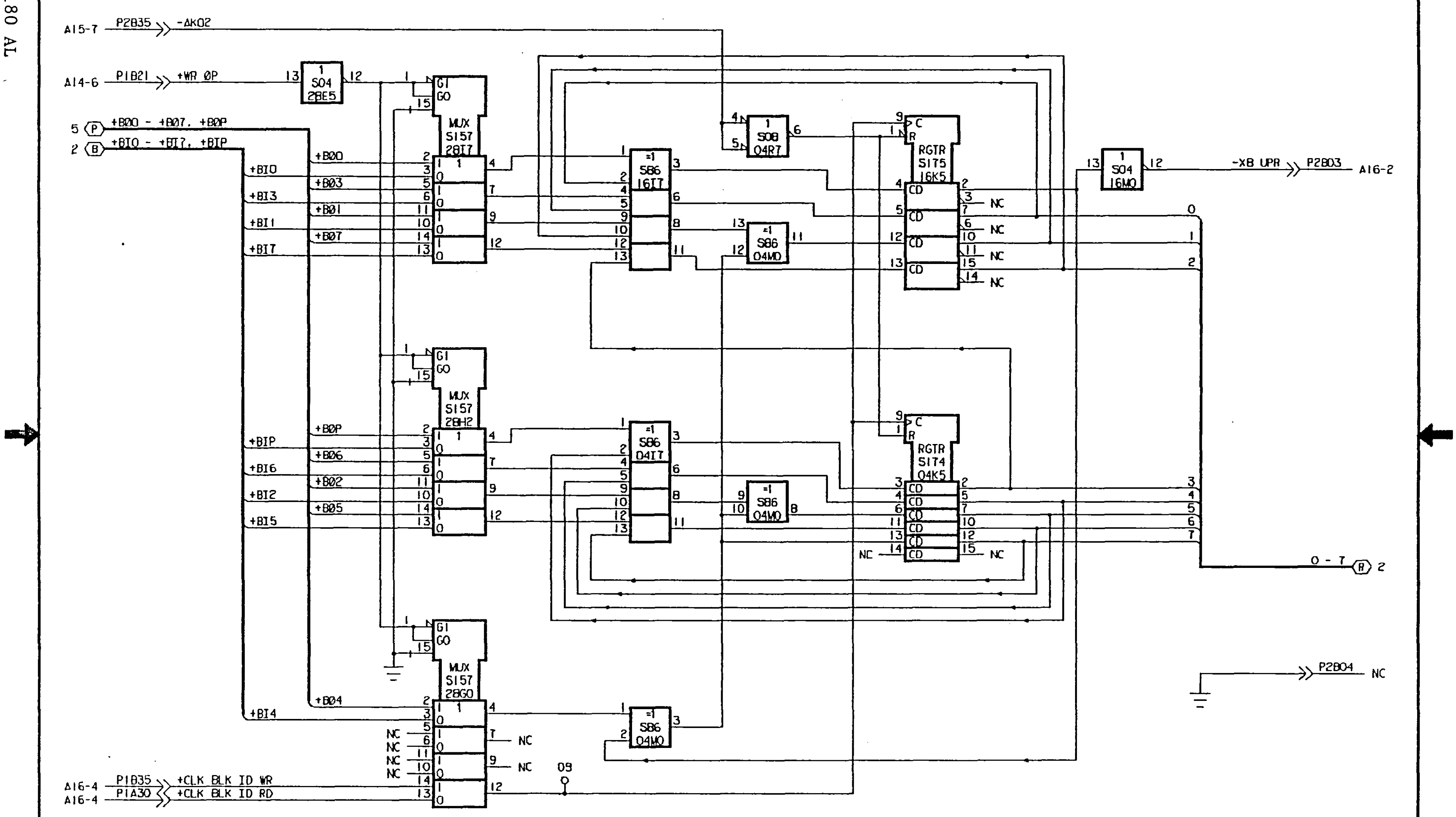
LØC:A19

DWG NO 23102910
REV C
SIZE C
SHEET I/F IV 5
PAGE 5 OF 6

FIPS INTERFACE - IV (A19-6)

BLOCK ID GENERATOR

This cyclic generator provides a 9-bit identification code for each block of bus-in data (BI0 through BI7, BIP) during a read operation and for each block of bus-out data (BO0 through BO7, BOP) during a write operation. The upper bit of the block ID (X8 Upr) is sent to the control flag register (A16-2) while the other eight bits are sent to the I bus multiplexer (A19-2). The block ID is read when the processor performs a read block ID operation.



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE-IV LOGIC DIAGRAM
BLOCK ID GENERATOR

LOC:A19

CODE IDENT	DWG NO	REV
C	23102910	C
	SHEET I/F IV 6	PAGE 6 OF 6

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PAGE						REVISION RECORD					
6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A		CLASS A RELEASED	MES	01/85	NZ	LBU
A	B	A	A	A	B	CA47357	SEE C.O.	MES	10/85	NZ	NZ
C	C	C	C	C	C	CA47702	INACTIVE, FOR SERVICE USE ONLY SUPERSEDED BY PWB-53590845	MES	8/12/86	NS	NS
D	D	D	D	D	D	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/28/87	NS	NS

NOTES:

1. THIS DOCUMENT IS CONTAINED ON MAGNETIC TAPE. MAGNETIC TAPE IS STORED IN THE EDP GROUP OF ENGINEERING SERVICES SECTION,CDED DIVISION.
2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	01/85
CHKD	N ZAK	01/85
ENGR	L.B. ULFIG	03/85
MFG	B.J. REILAND	03/85
APVD	L.B. ULFIG	03/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
LOGIC DIAGRAM
FIPS I/F 4

PWA-22194397 PWB-23140958

SIZE C FSCM NO. 34010 DWG NO. 23140959

LOC. A19 SHEET I/F IV 1-R PAGE 1 OF 6

FIPS INTERFACE - IV (A19-2)

BUS IN

Bus-in bits 0 through 7 carry read data or status information from the tape or disk device to the coupler. The bus-in receivers route the bus-in information to the R register, the parity check circuit, the code conversion read RAM (A19-3), and the block ID generator multiplexer (A19-6).

PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the eight bus-in bits and associated parity bit. A bus-in parity error is sent to the control flag register (A17-7, A16-2) if an error occurs during transmission of bus-in data from the tape or disk device.

R REGISTER

The bus-in bits are clocked into the R register by the -P3 clock from the FIPS interface UDI (A15-8). The bus-in bits are then sent from the R register to the data byte compare circuit and the I bus multiplexer.

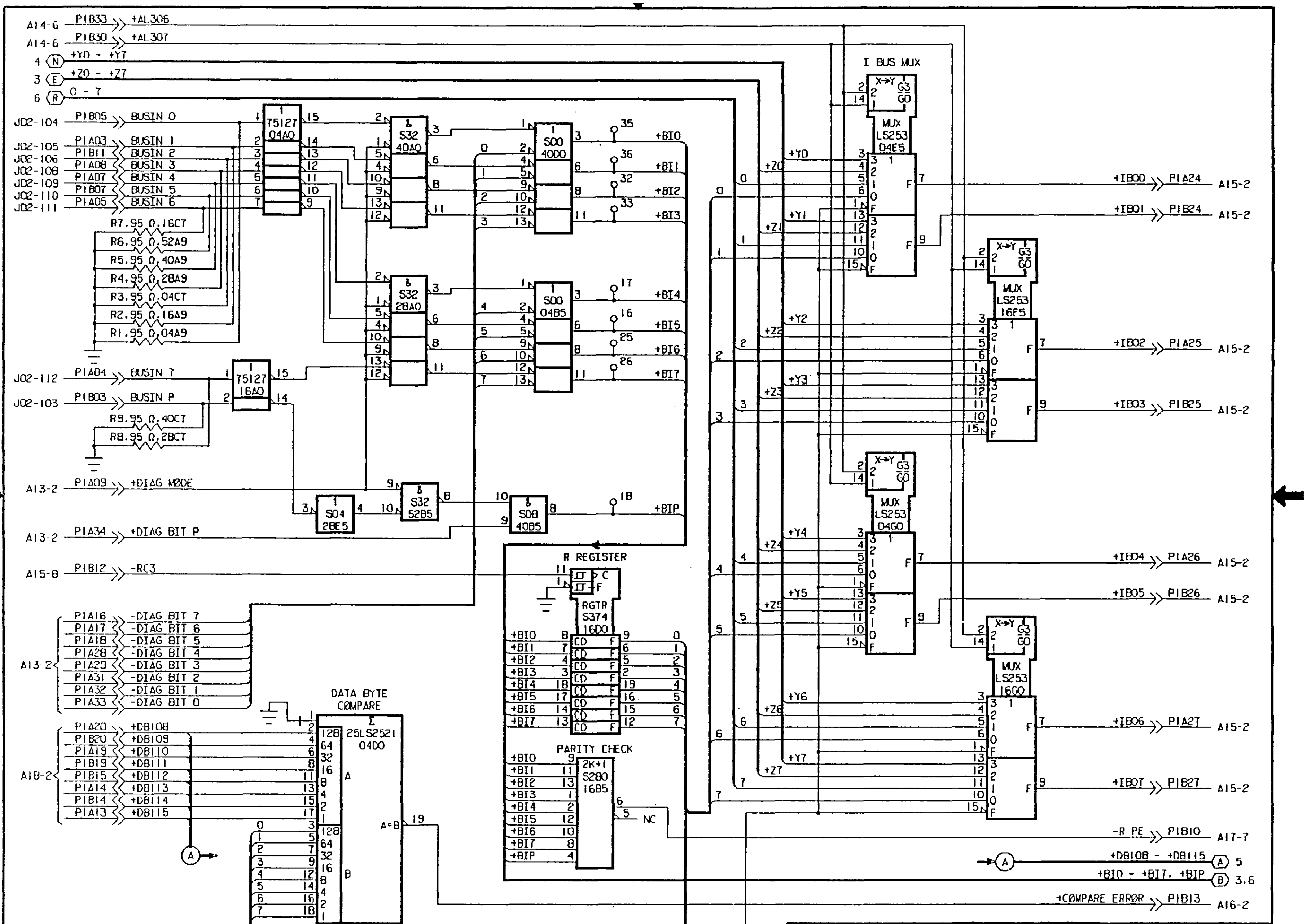
DATA BYTE COMPARE CIRCUIT

The data byte compare circuit compares the expected bus-in byte (bits DB108 through DB115) with the last actual bus-in byte (bits BI0 through BI7) received by the R register. A compare error is sent to the control flag register (A16-2) if the bytes are not identical.

I BUS MUX

Addressable latch bits AL306 and AL307 form a code to enable the multiplexer to gate the following information to the I bus.

AL306	AL307	I-Bus Information
0	0	R register (bits BI0 through BI7)
0	1	Block ID (bits 0 through 7)
1	0	Read conversion memory (bits Z0 through Z7)
1	1	Write conversion memory (bits Y0 through Y7)



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
BUS IN RECEIVERS
R' REGISTER, I BUS MUX

LOC:A19

CODE IDENT	DWG NO	REV
C	23140959	D

SHEET	PAGE
I/F IV 2-R	2 OF 6

LOAD CODE

When the processor selects a load code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for loading conversion codes (bits B00 through B07) into the RAM.

COPY CODE

When the processor selects a read (copy) code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for reading the conversion codes from the code conversion read RAM and transferring them to the R´ register.

CODE CONVERSION READ OPERATION

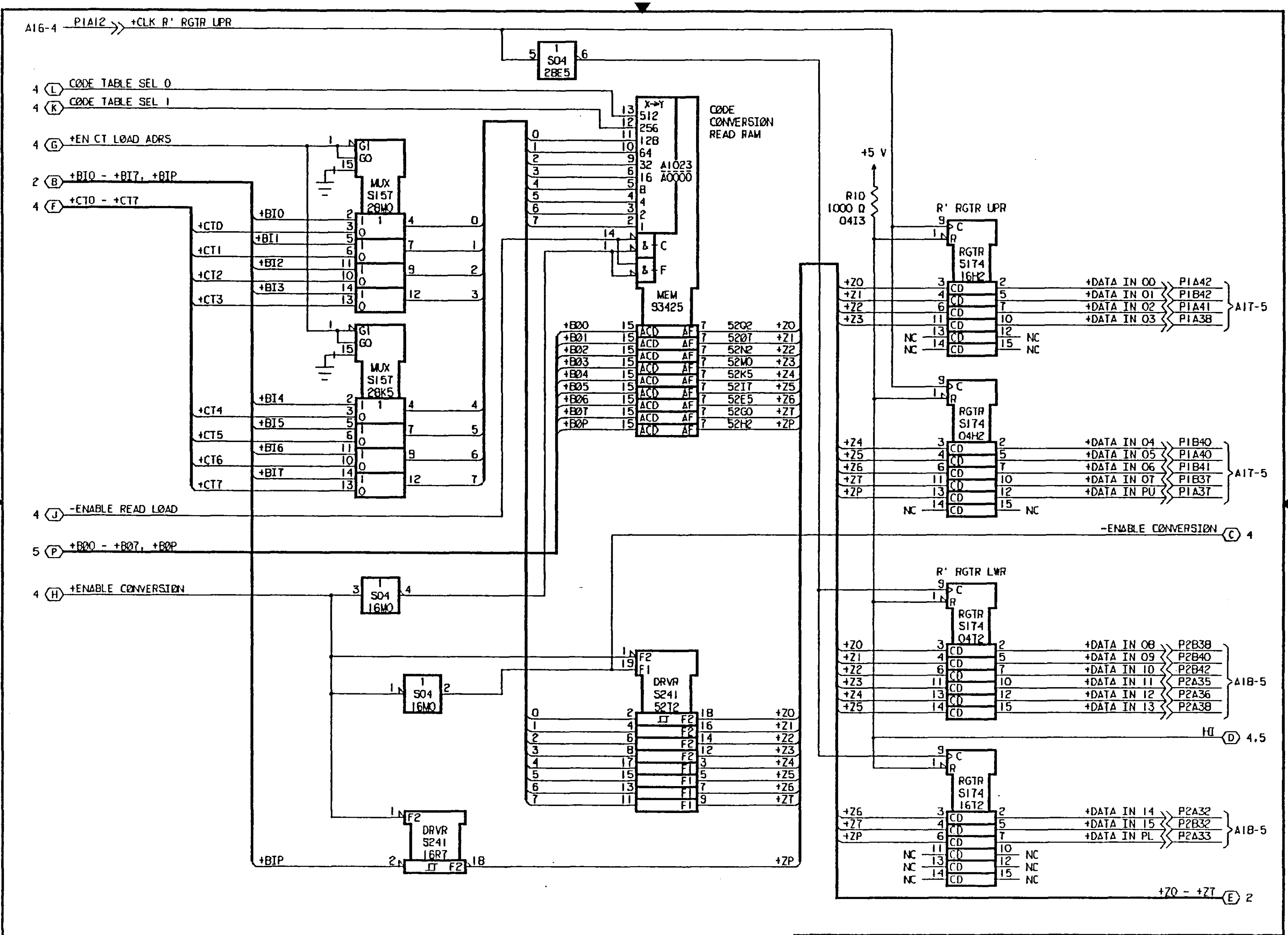
When data is read with code conversion, the data character (bits BI0 through BI7) from the tape device is used as an address to read its corresponding conversion code from the code conversion read RAM. This coded character is eventually sent to the CYBER channel in place of the tape device data character.

When data is read with code conversion disabled, bus-in bits BI0 through BI7 are gated through the driver and bypass the code conversion read RAM.

CODE TABLE SELECT

The code table select signals form a code to select one of four tables in the code conversion read RAM as follows:

Code Table Sel 0	Code Table Sel 1	Table
0	0	1
0	1	2
1	0	3
1	1	4



CONTROL DATA	FIPS INTERFACE - IV LOGIC DIAGRAM READ CODE CONVERSION R' REGISTER	CODE IDENT	DWG NO 23140959	REV D
DEVELOPMENT DIVISION	LOC:A19	C	SHEET I/F IV 3-R	PAGE 3 OF 6

FIPS INTERFACE - IV (A19-4)

LOAD CODE

When the processor selects a load code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for loading conversion codes (bits B00 through B07) into the RAM.

COPY CODE

When the processor selects a read (copy) code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for reading the conversion codes from the code conversion read RAM and transferring them to the R′ register.

CODE CONVERSION READ OPERATION

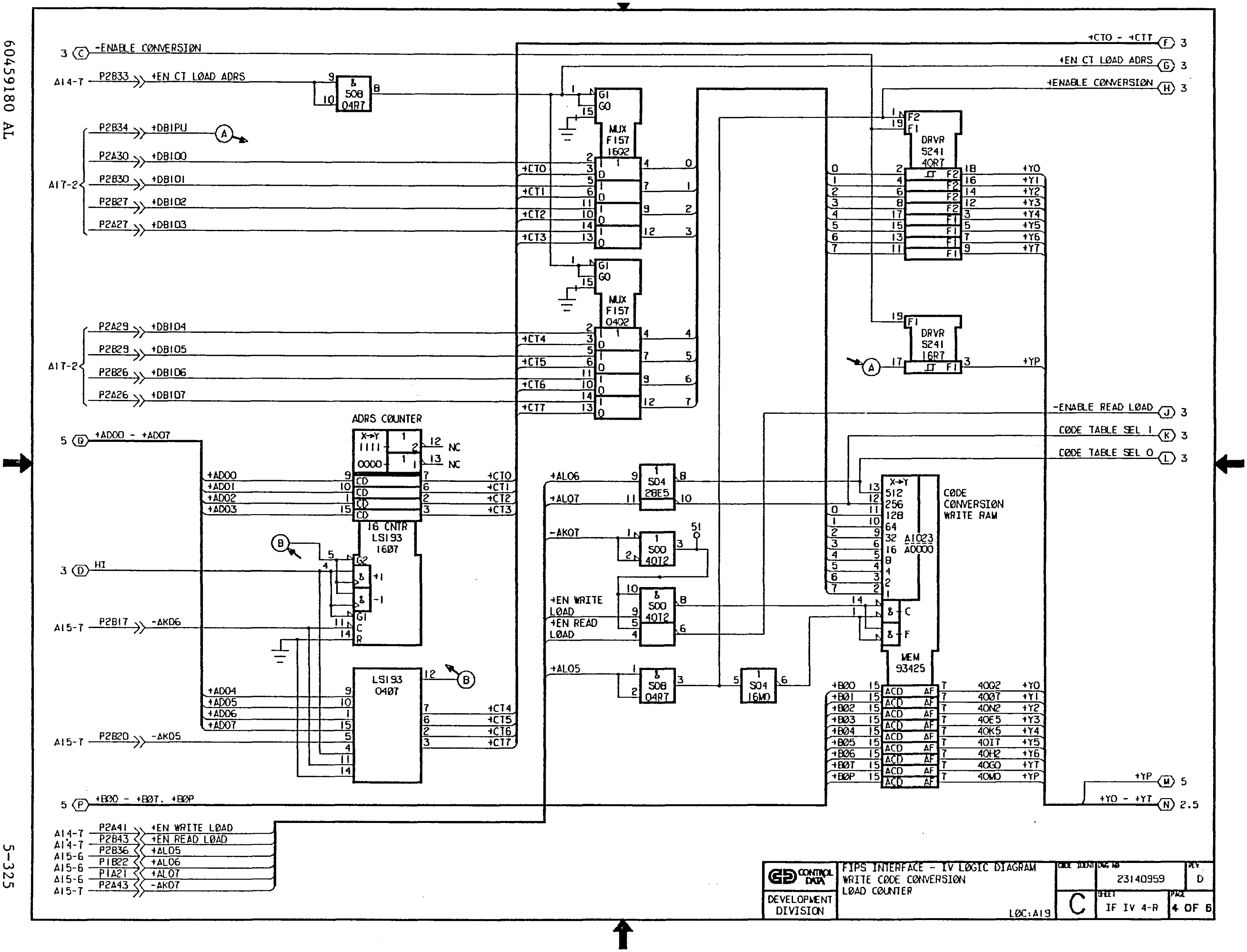
When data is read with code conversion, the data character (bits BI0 through BI7) from the tape device is used as an address to read its corresponding conversion code from the code conversion read RAM. This coded character is eventually sent to the CYBER channel in place of the tape device data character.

When data is read with code conversion disabled, bus-in bits BI0 through BI7 are gated through the driver and bypass the code conversion read RAM.

CODE TABLE SELECT

The code table select signals form a code to select one of four tables in the code conversion read RAM as follows:

Code Table Sel 0	Code Table Sel 1	Table
0	0	1
0	1	2
1	0	3
1	1	4



CONTROL DATA

DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
WRITE CODE CONVERSION
LOAD COUNTER

LOC: A19

CODE IDENT	DWG NO	REV
C	23140959	D
	SHEET IF IV 4-R	PAGE 4 OF 6

FIPS INTERFACE - IV (A19-5)

X′ REGISTER

Data bus information (bits Y0 through Y7) is clocked into the X′ register during a direct memory access (DMA) write operation. The write data bits (B00 through B07) from the X′ register are then sent to the FIPS device on the bus-out lines. The X′ register bits are also sent to the parity generator (A19-5) and to the block ID generator (A19-6).

X REGISTER

Assembly/disassembly information (bits AD00 through AD07) is clocked into the X register during a universal device interface (UDI) write operation. The write data bits (B00 through B07) from the X register are then written into the code conversion read RAM (A19-3) or code conversion write RAM (A19-4) during a load conversion code operation or sent directly to the FIPS device on the bus-out lines during a normal write operation.

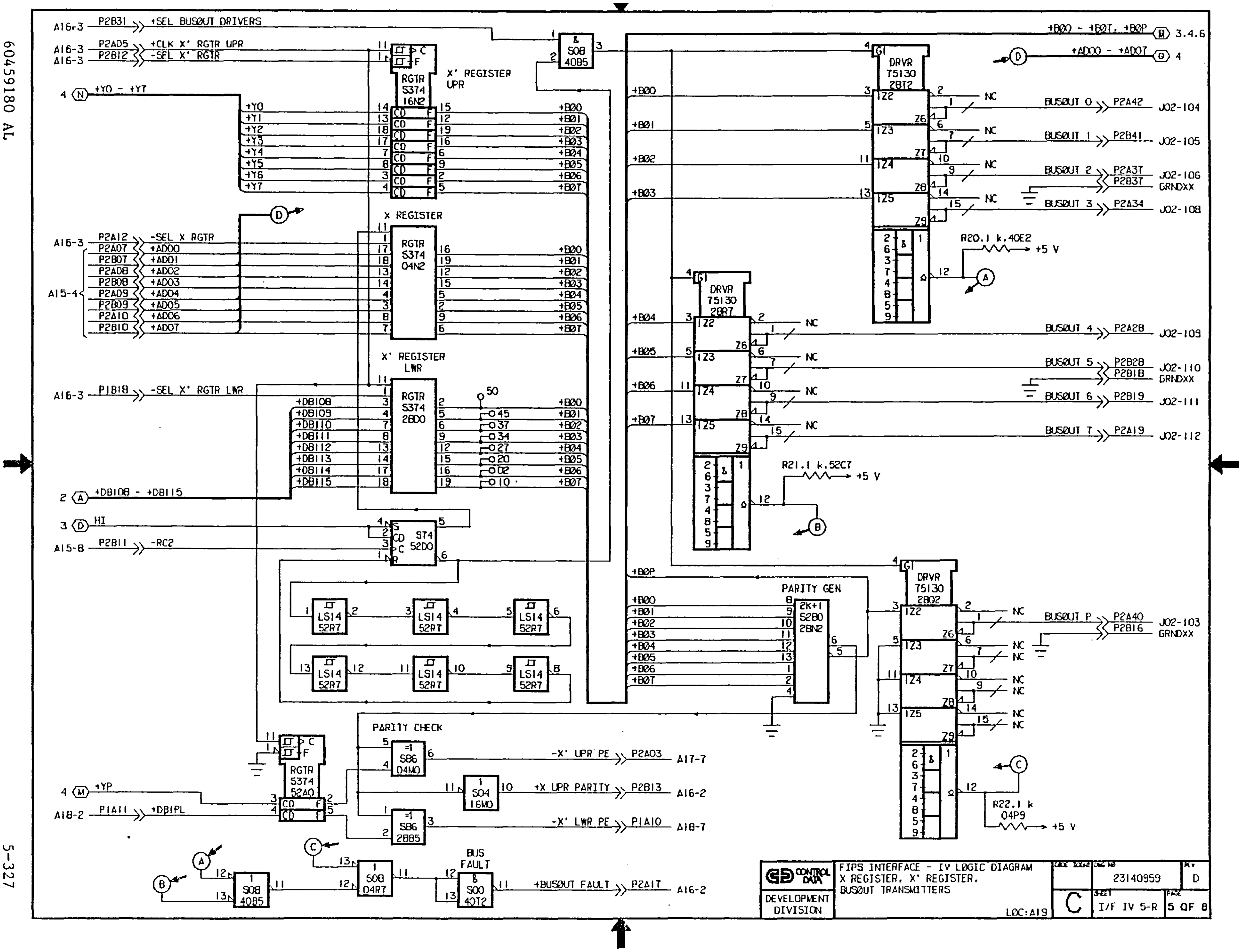
The X register bits are also sent to the parity generator (A19-5) and the block ID generator (A19-6).

PARITY GENERATION

A parity bit is generated on data from either the X′ register or the X register. The parity bit is sent to the external FIPS device on the Busout P line, to the control flag register (A16-2), and to the parity check circuit (A19-5).

PARITY CHECK CIRCUIT

This circuit compares the DMA write data parity bit (YP) with the parity bit generated from the DMA write data after it passes through the X′ register. A write path parity error is sent to the control flag register (A16-2) if an error occurs in transmission of DMA write data.



CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
X REGISTER, X' REGISTER,
BUSOUT TRANSMITTERS

LOC:A19

C

23140959

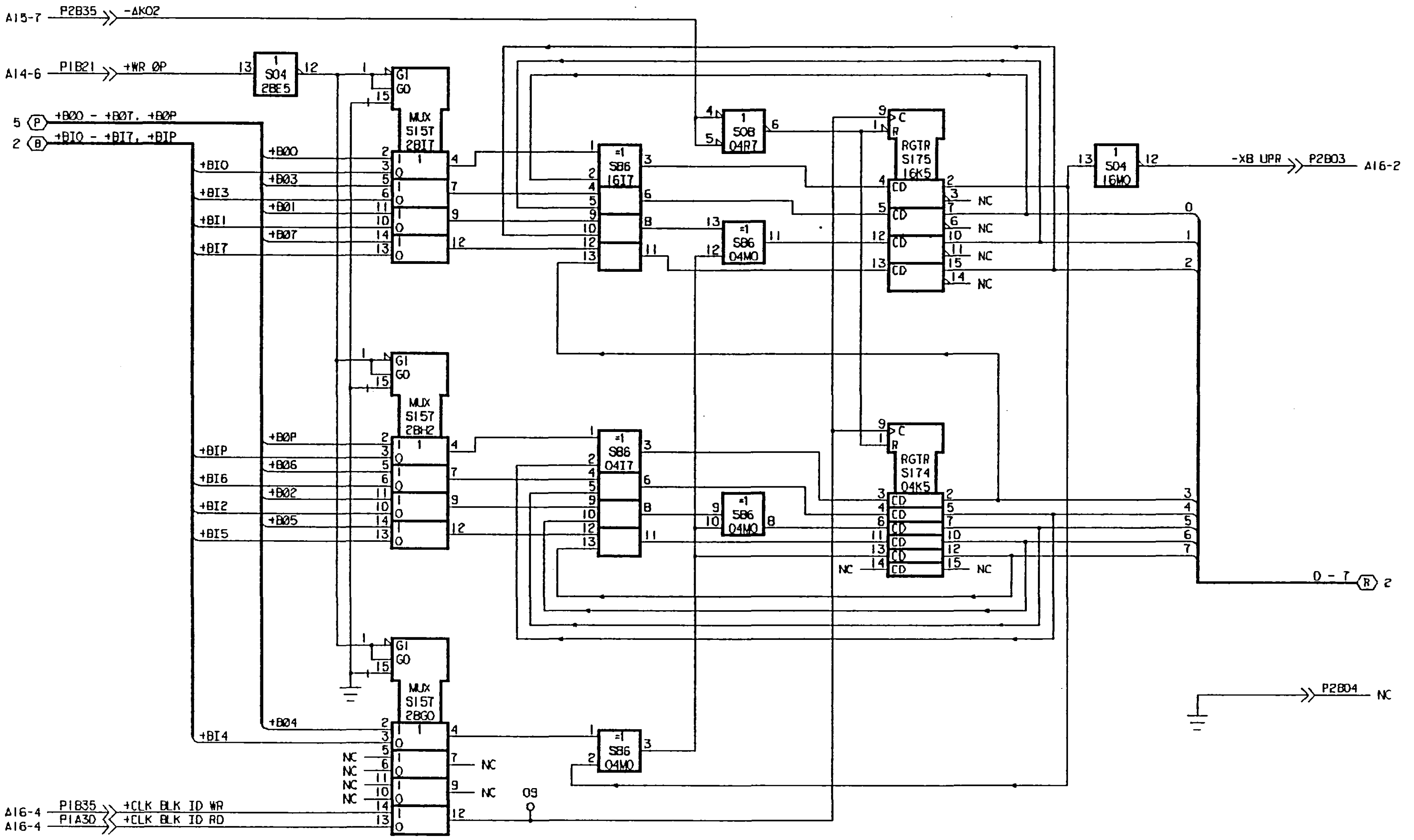
D

I/F IV 5-R

5 OF 8

BLOCK ID GENERATOR

This cyclic generator provides a 9-bit identification code for each block of bus-in data (BI0 through BI7, BIP) during a read operation and for each block of bus-out data (BO0 through BO7, BOP) during a write operation. The upper bit of the block ID (X8 Upr) is sent to the control flag register (A16-2) while the other eight bits are sent to the I bus multiplexer (A19-2). The block ID is read when the processor performs a read block ID operation.



CONTROL DATA	FIPS INTERFACE-IV LOGIC DIAGRAM BLOCK ID GENERATOR	CODE IDENT	DWG NO 23140959	REV D
DEVELOPMENT DIVISION	LOC:A19	C	SHEET I/F IV 6-R	PAGE 6 OF 6

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PAGE						REVISION RECORD					
6	5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	A		CLASS A RELEASED	EFA	11/85	NZ	RTH
B	B	B	B	B	B	CA47702	SEE NOTE 4	MES	8/18/86	NS	NS
C	C	C	C	C	C	CA48239	ADDED COVER, RE-INTERSHEET	MES	1/28/87	NS	NS
D	C	C	C	C	D	CA48539	SEE NOTE 5	MES	1/30/87	NS	NS
E	C	C	C	C	E	CA48580	CHANGED R29 LOC TO 28H2	MES	2/13/87	NS	NS
E	F	C	C	C	F	CA49088	SEE C.O.	KMS	8/13/87	NS	NS
E	G	C	C	C	G	CA49213	SEE C.O.	KMS	9/15/87	NS	NS

NOTES:

1. THIS DOCUMENT IS CONTAINED ON MAGNETIC TAPE. MAGNETIC TAPE IS STORED IN THE EDP GROUP OF ENGINEERING SERVICES SECTION,CDED DIVISION.
2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.
4. THE CHIP IDENTIFIERS ON PWA-53590844 WERE CHANGED TO 'F' TYPE CHIPS, UNLESS OTHERWISE NOTED. EXAMPLE 'ST4' ON PWA-22194397 IS NOW 'FT4' ON PWA-53590844.
5. THE 'FIT4' CHIP AT LOCATION D4K5 AND THE 'FI75' CHIP AT LOCATION 16K5 WERE CHANGED BACK TO 'SI74 AND SI75' CHIPS. ADDED 330 OHM RESISTOR BETWEEN PINS P1A23 AND P1A30. SEE PAGE 6.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	E F ARLANDSON	01/85
CHKD	N ZAK	01/85
ENGR	R T HENNING	12/85
MFG	B J REILAND	02/86
APVD	R T HENNING	12/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM
FIPS I/F 4

PWA-10283690
PWB-53590845

SIZE C
FSCM NO. 34010
DWG NO. 53590846

LOC: A19
SHEET I/F IV 1-F
PAGE 1 OF 6

CALMA

CSIZECOVER1

FIPS INTERFACE - IV (A19-2)

BUS IN

Bus-in bits 0 through 7 carry read data or status information from the tape or disk device to the coupler. The bus-in receivers route the bus-in information to the R register, the parity check circuit, the code conversion read RAM (A19-3), and the block ID generator multiplexer (A19-6).

PARITY CHECK CIRCUIT

This circuit performs an odd parity check of the eight bus-in bits and associated parity bit. A bus-in parity error is sent to the control flag register (A17-7, A16-2) if an error occurs during transmission of bus-in data from the tape or disk device.

R REGISTER

The bus-in bits are clocked into the R register by the -P3 clock from the FIPS interface UDI (A15-8). The bus-in bits are then sent from the R register to the data byte compare circuit and the I bus multiplexer.

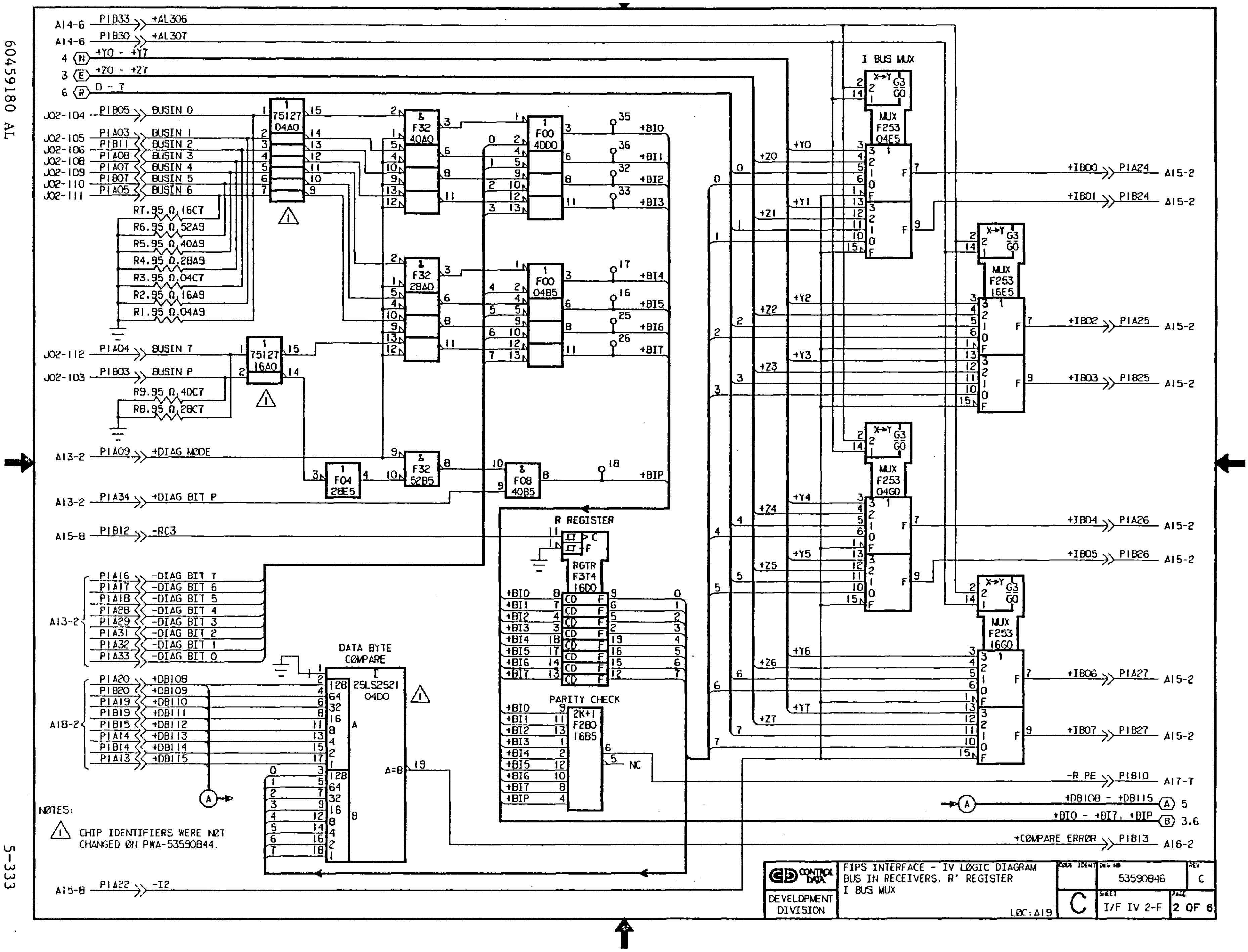
DATA BYTE COMPARE CIRCUIT

The data byte compare circuit compares the expected bus-in byte (bits DB108 through DB115) with the last actual bus-in byte (bits BI0 through BI7) received by the R register. A compare error is sent to the control flag register (A16-2) if the bytes are not identical.

I BUS MUX

Addressable latch bits AL306 and AL307 form a code to enable the multiplexer to gate the following information to the I bus.

AL306	AL307	I-Bus Information
0	0	R register (bits BI0 through BI7)
0	1	Block ID (bits 0 through 7)
1	0	Read conversion memory (bits Z0 through Z7)
1	1	Write conversion memory (bits Y0 through Y7)



NOTES:

⚠ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590844.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
BUS IN RECEIVERS, R' REGISTER
I BUS MUX

LOC: A19

CODE IDENT
C

DWG NO 53590846

REV C

SHEET I/F IV 2-F

PAGE 2 OF 6

FIPS INTERFACE - IV (A19-3)

LOAD CODE

When the processor selects a load code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for loading conversion codes (bits B00 through B07) into the RAM.

COPY CODE

When the processor selects a read (copy) code read table operation, bits CT0 through CT7 from the address counter (A19-4) are gated through the multiplexer and sent to the code conversion read RAM. These bits provide the addresses for reading the conversion codes from the code conversion read RAM and transferring them to the R′ register.

CODE CONVERSION READ OPERATION

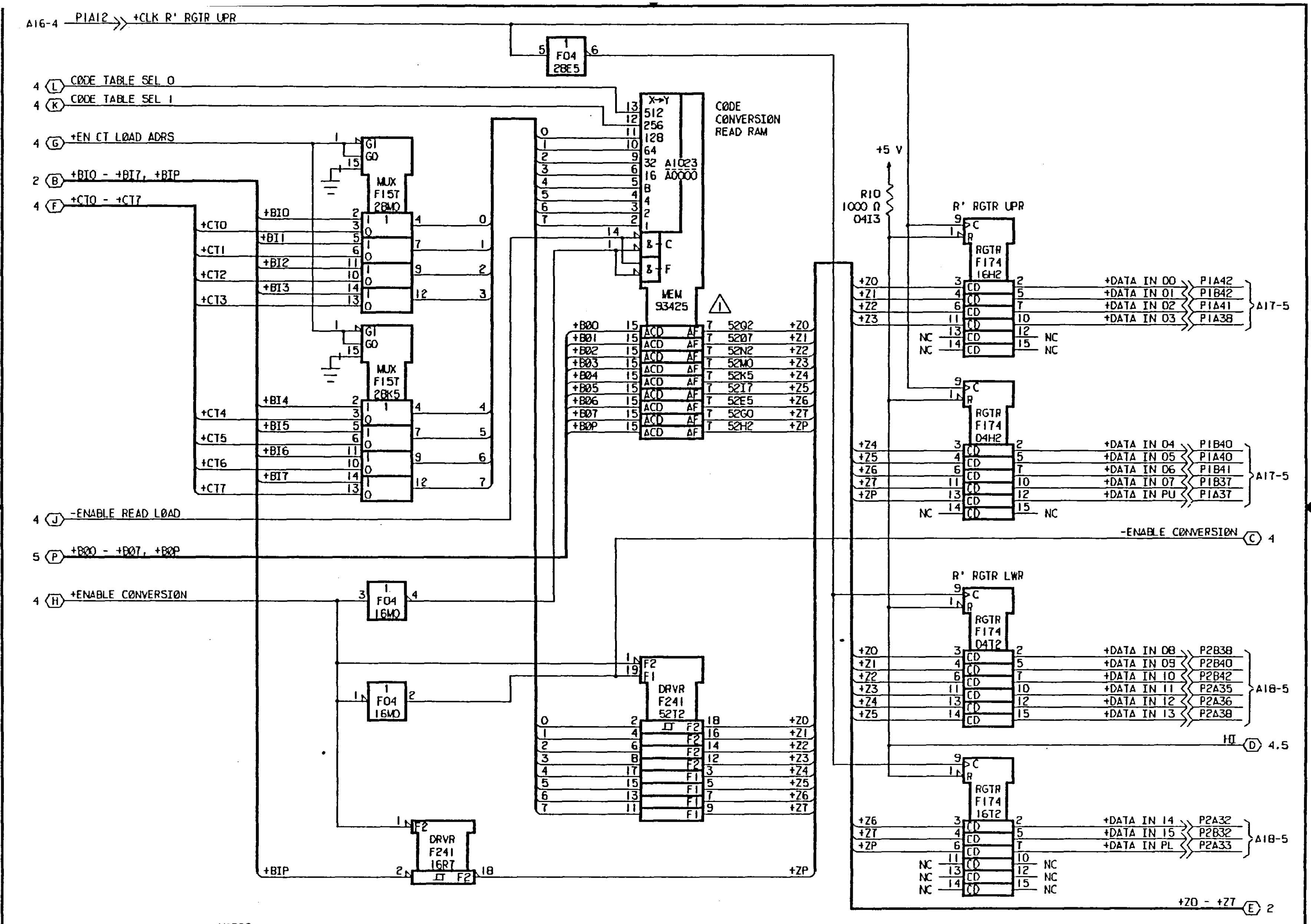
When data is read with code conversion, the data character (bits BI0 through BI7) from the tape device is used as an address to read its corresponding conversion code from the code conversion read RAM. This coded character is eventually sent to the CYBER channel in place of the tape device data character.

When data is read with code conversion disabled, bus-in bits BI0 through BI7 are gated through the driver and bypass the code conversion read RAM.

CODE TABLE SELECT

The code table select signals form a code to select one of four tables in the code conversion read RAM as follows:

Code Table Sel 0	Code Table Sel 1	Table
0	0	1
0	1	2
1	0	3
1	1	4



NOTES:

△1 CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590844.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
READ CODE CONVERSION
R' REGISTER

LOC:A19

CODE IDENT	DWG NO	REV
	53590846	C
C	SHEET I/F IV 3-F	PAGE 3 OF 6

LOAD CODE

When the processor selects a load code write table operation, assembly/disassembly bits AD00 through AD07 are clocked through the address counter (bits CT0 through CT7), gated through the multiplexer, and sent to the code conversion write RAM. These bits provide the addresses for loading conversion codes (bits B00 through B07) into the RAM. The address counter increments by one each time a conversion code is entered.

COPY CODE

When the processor selects a read (copy) code write table operation, assembly/disassembly bits AD00 through AD07 are clocked through the address counter (bits CT0 through CT7), gated through the multiplexer, and sent to the code conversion write RAM. These bits provide the address for reading the conversion codes from the RAM. The address counter increments by one each time a conversion code is read.

CODE CONVERSION WRITE OPERATION

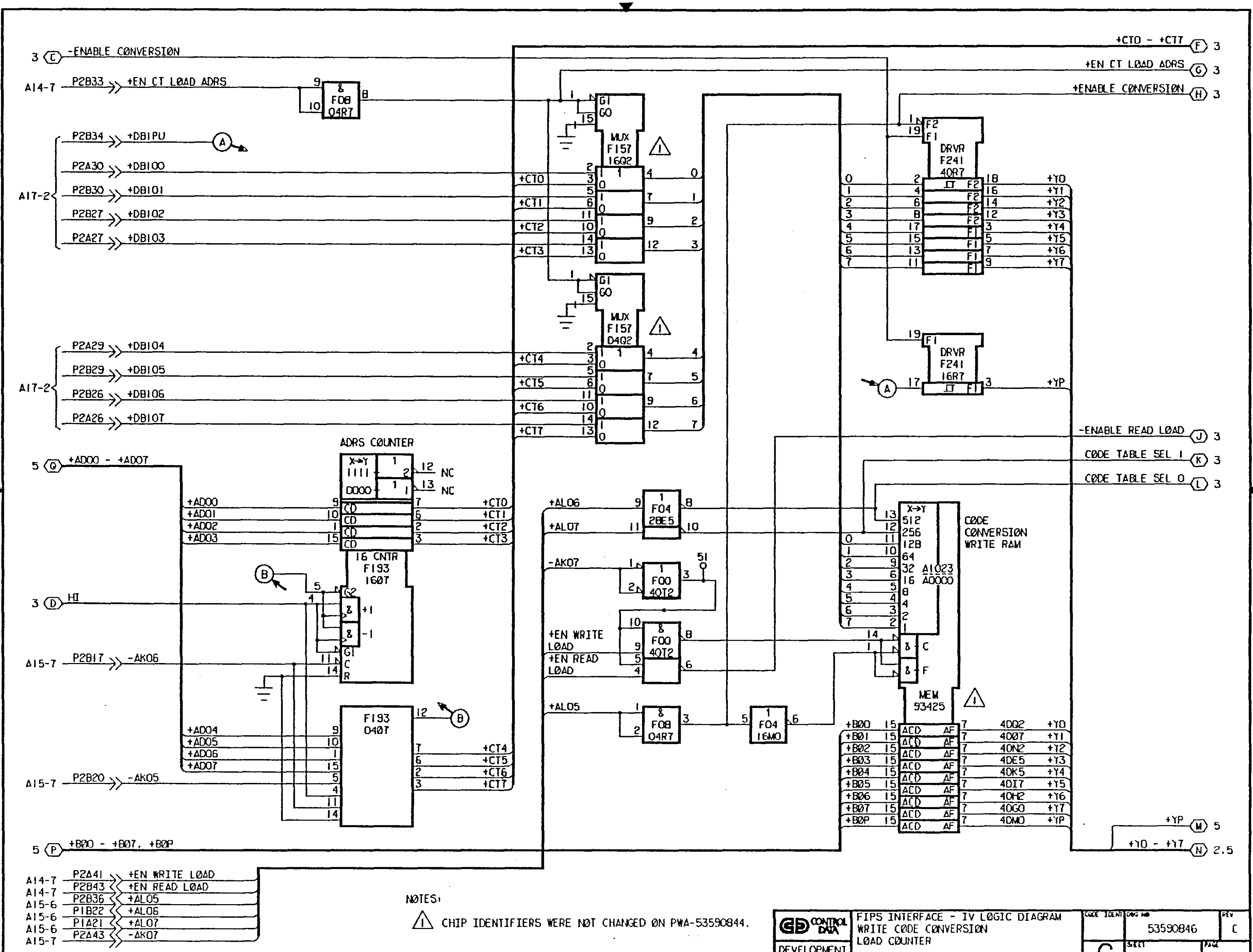
When data is written with code conversion, the data character (bits DB100 through DB107) from the CYBER channel is used as an address to read its corresponding conversion code from the code conversion write RAM. This coded character is eventually sent to the tape device in place of the CYBER channel data character.

When data is written with code conversion disabled, data bus bits DB100 through DB107 are gated through the driver and bypass the code conversion write RAM.

CODE TABLE SELECT

The code table select signals form a code to select one of four tables in the code conversion write RAM as follows:

Code Table Sel 0	Code Table Sel 1	Table
0	0	1
0	1	2
1	0	3
1	1	4



NOTES:

△ CHIP IDENTIFIERS WERE NOT CHANGED ON PWA-53590844.

CONTROL DATA
DEVELOPMENT DIVISION

FIPS INTERFACE - IV LOGIC DIAGRAM
WRITE CODE CONVERSION
LOAD COUNTER

LOC: A19

CODE IDENT	DWG NO	REV
	53590846	C
C	SHEET I/F IV 4-F	PAGE 4 OF 8

FIPS INTERFACE - IV (A19-5)

X′ REGISTER

Data bus information (bits Y0 through Y7) is clocked into the X′ register during a direct memory access (DMA) write operation. The write data bits (B00 through B07) from the X′ register are then sent to the FIPS device on the bus-out lines. The X′ register bits are also sent to the parity generator (A19-5) and to the block ID generator (A19-6).

X REGISTER

Assembly/disassembly information (bits AD00 through AD07) is clocked into the X register during a universal device interface (UDI) write operation. The write data bits (B00 through B07) from the X register are then written into the code conversion read RAM (A19-3) or code conversion write RAM (A19-4) during a load conversion code operation or sent directly to the FIPS device on the bus-out lines during a normal write operation.

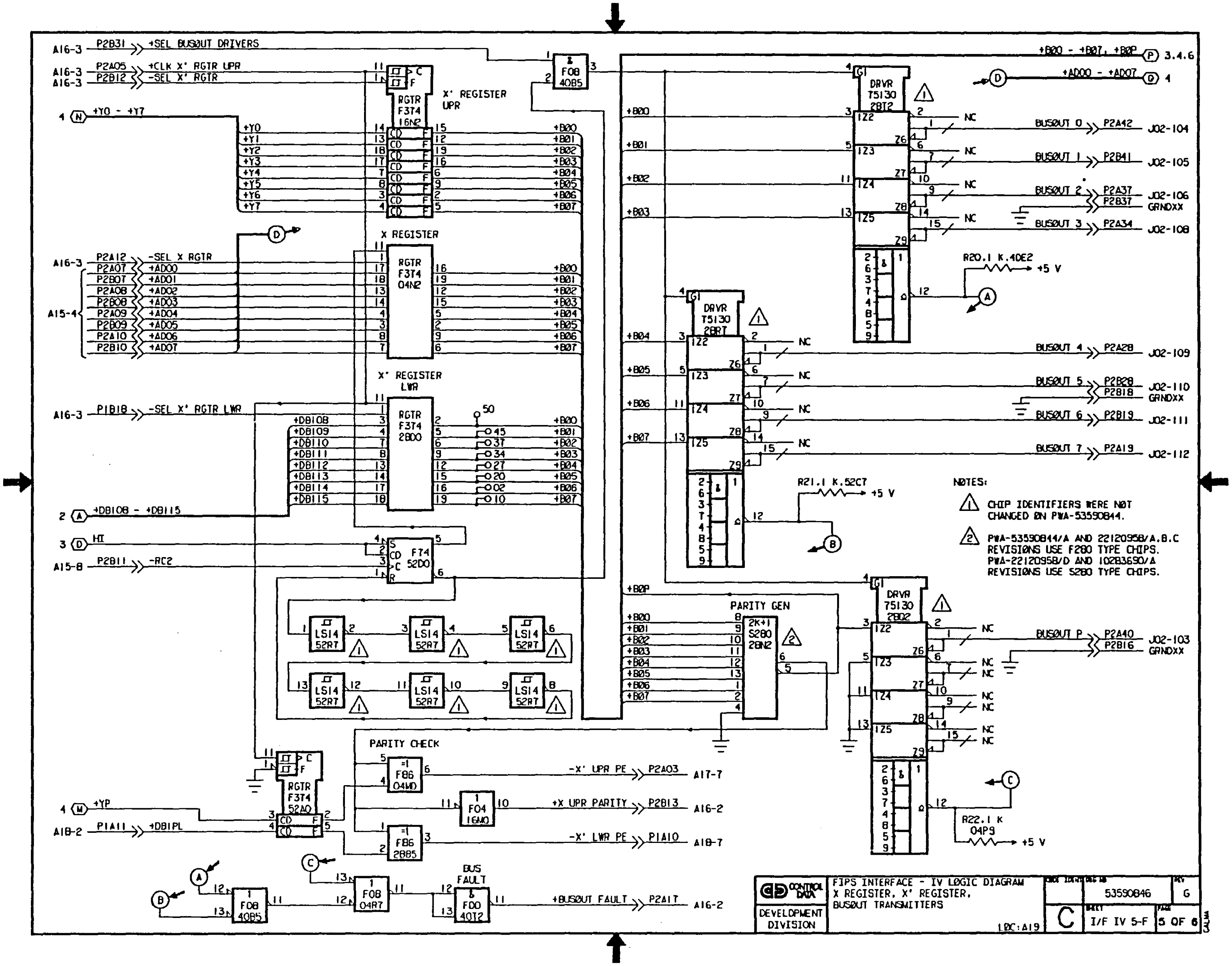
The X register bits are also sent to the parity generator (A19-5) and the block ID generator (A19-6).

PARITY GENERATION

A parity bit is generated on data from either the X′ register or the X register. The parity bit is sent to the external FIPS device on the Busout P line, to the control flag register (A16-2), and to the parity check circuit (A19-5).

PARITY CHECK CIRCUIT

This circuit compares the DMA write data parity bit (YP) with the parity bit generated from the DMA write data after it passes through the X′ register. A write path parity error is sent to the control flag register (A16-2) if an error occurs in transmission of DMA write data.



NØTES:

⚠1 CHIP IDENTIFIERS WERE NØT CHANGED ØN PWA-53590844.

⚠2 PWA-53590844/A AND 22120958/A.B.C REVISIØNS USE F280 TYPE CHIPS. PWA-22120958/D AND 10283690/A REVISIØNS USE S280 TYPE CHIPS.

CONTROL DATA
DEVELOPMENT DIVISION

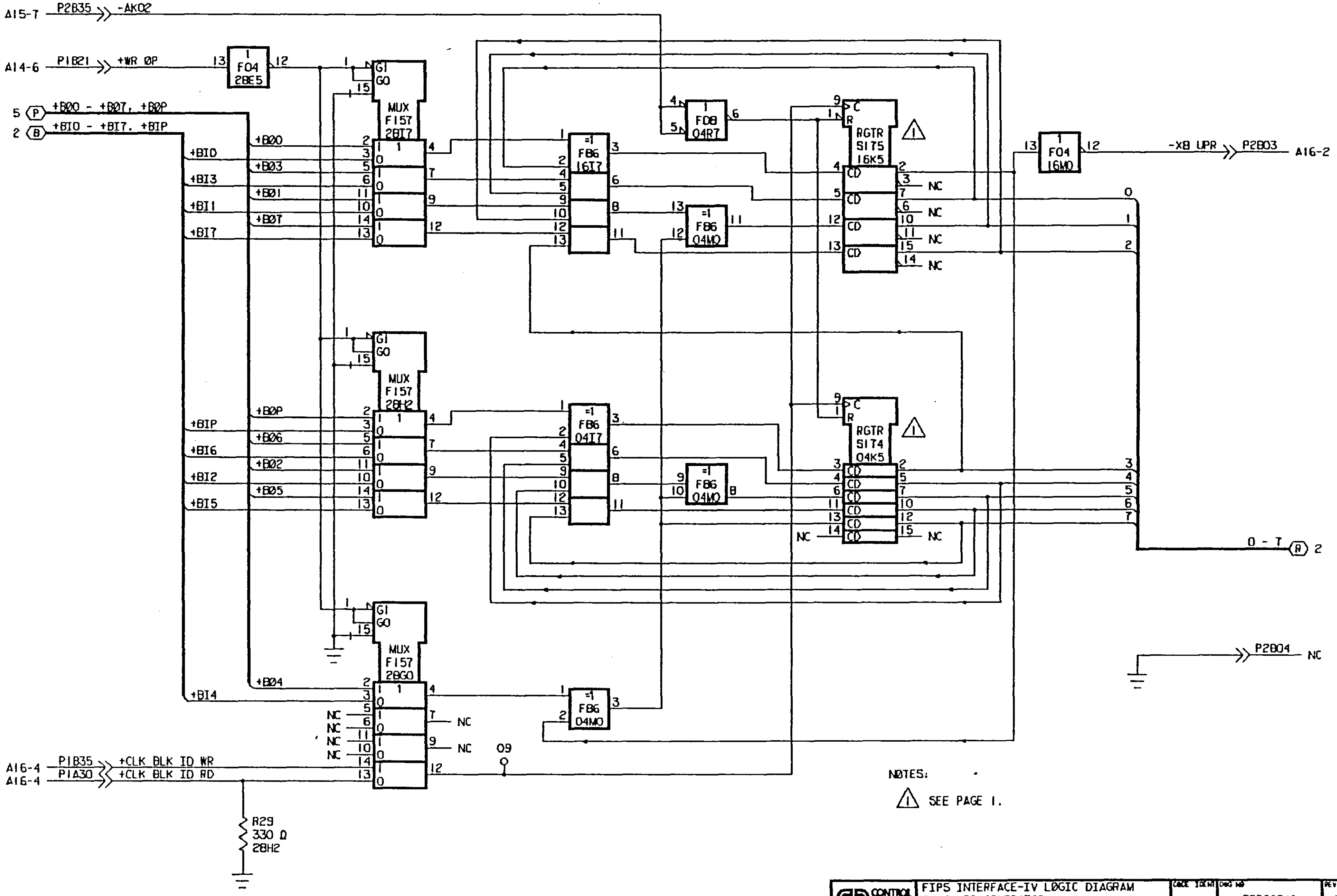
FIPS INTERFACE - IV LØGIC DIAGRAM
X REGISTER, X' REGISTER,
BUSØUT TRANSMITTERS

LØC:A19

	53590846	G
C	I/F IV 5-F	5 OF 6

BLOCK ID GENERATOR

This cyclic generator provides a 9-bit identification code for each block of bus-in data (BI0 through BI7, BIP) during a read operation and for each block of bus-out data (B00 through B07, BOP) during a write operation. The upper bit of the block ID (X8 Upr) is sent to the control flag register (A16-2) while the other eight bits are sent to the I bus multiplexer (A19-2). The block ID is read when the processor performs a read block ID operation.



NOTES:

⚠1 SEE PAGE 1.

CONTROL DATA DEVELOPMENT DIVISION	FIPS INTERFACE-IV LOGIC DIAGRAM BLOCK ID GENERATOR LOC:A19	C	DWG NO 53590846 SHEET I/F IV 6-F	REV E PAGE 6 OF 8

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PAGE					REVISION RECORD					
5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A		CLASS A RELEASED	MES	12/84	NZ	NZ
B	B	B	B	B	CA47162	INACTIVE, FOR SERVICE USE ONLY SUPERSEDED BY PWB-53812429	MES	01/86	NZ	NZ
C	C	C	C	C	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/FEB/87	NS	NS

NOTES:

1. THIS DOCUMENT IS CONTAINED ON MAGNETIC TAPE. MAGNETIC TAPE IS STORED IN THE EDP GROUP OF ENGINEERING SERVICES SECTION,CDED DIVISION.
2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	12/84
CHKD	N ZAK	12/84
ENGR	R T HENNING	02/85
MFG	B J REILAND	02/85
APVD	R T HENNING	02/85

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

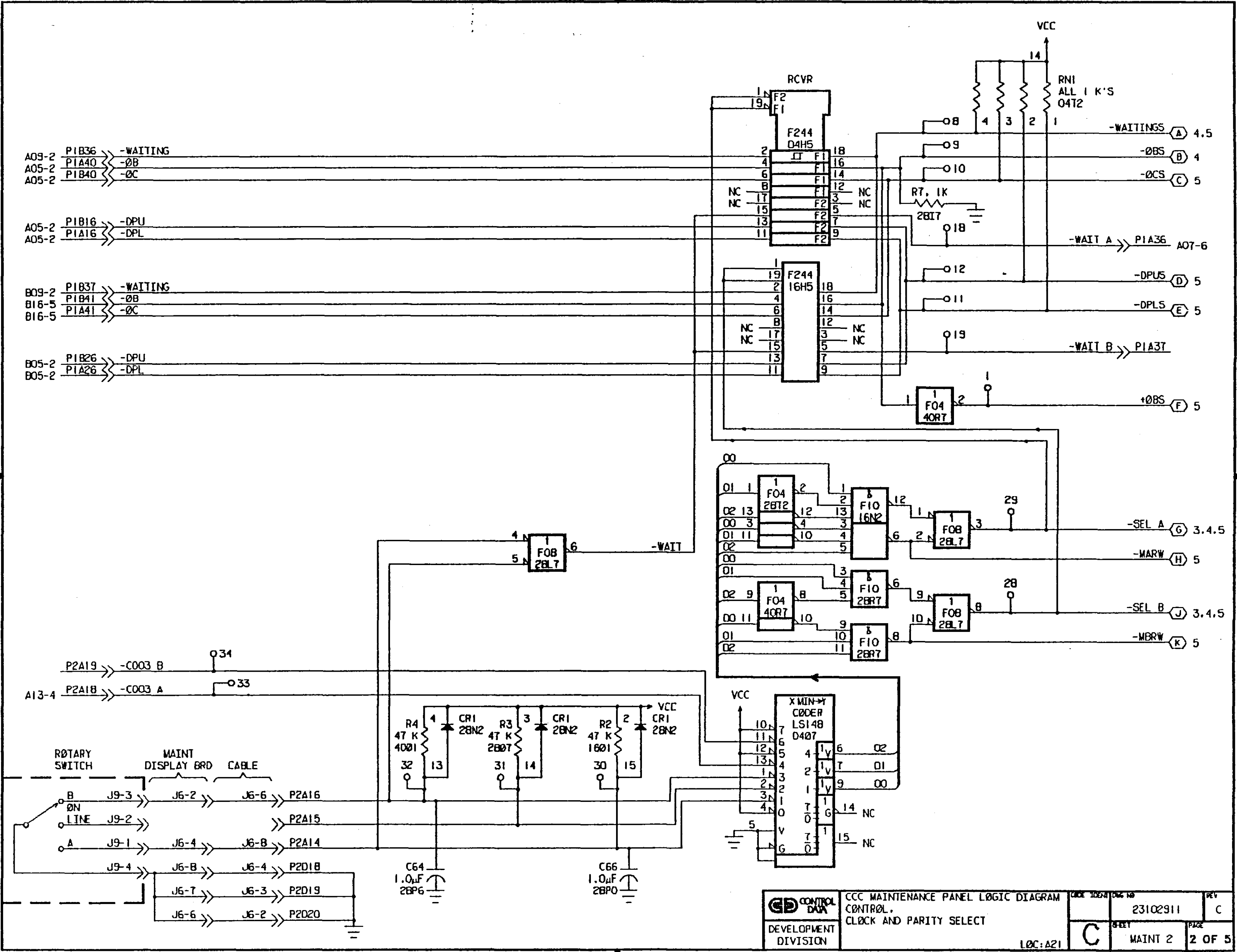
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE

LOGIC DIAGRAM MAINTENANCE BOARD

PWA-67184806
PWB-24670930

SIZE C
FSCM NO. 34010
DWG NO. 23102911
LOC: A21
SHEET MAINT 1
PAGE 1 OF 5



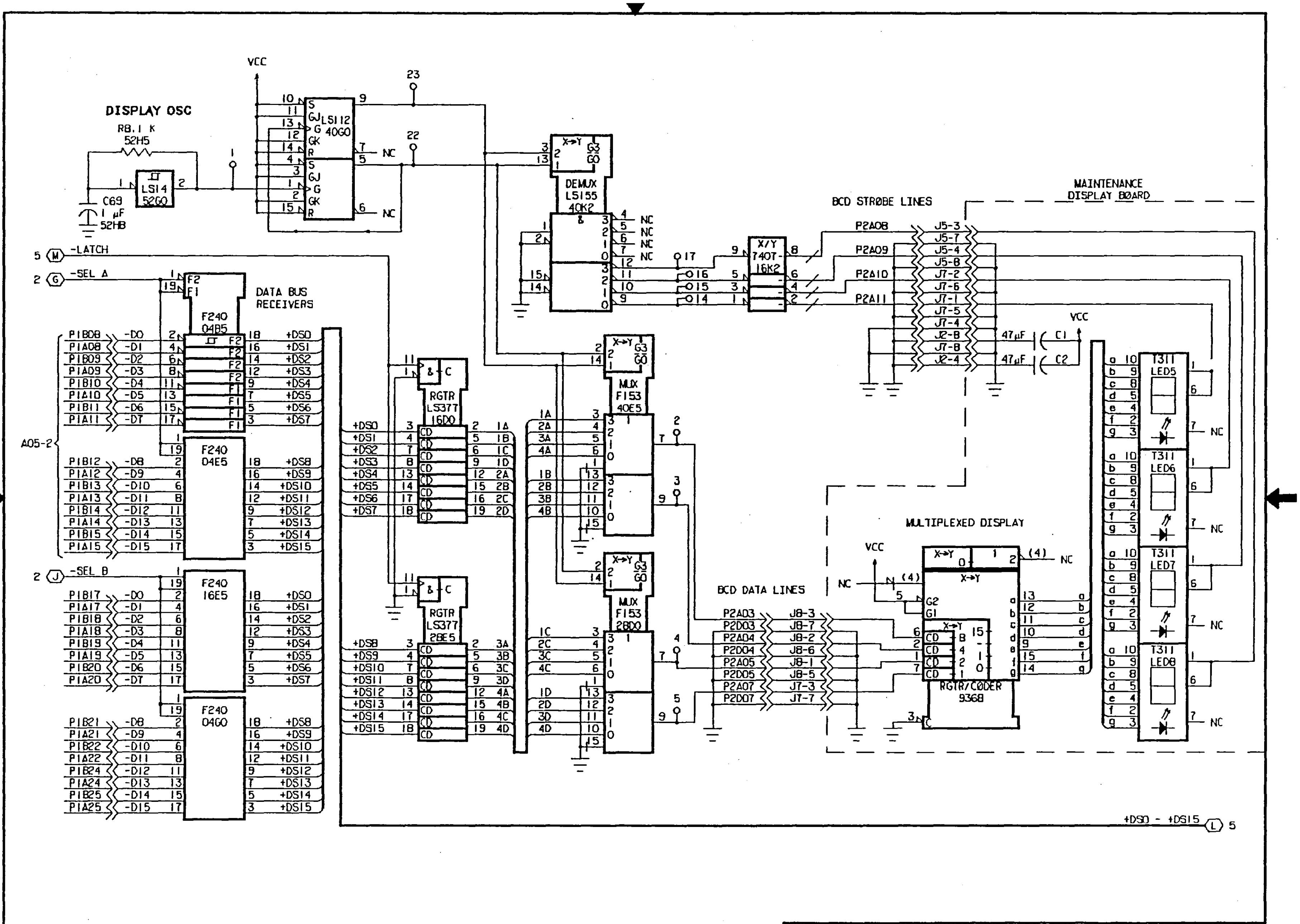
CONTROL DATA

DEVELOPMENT DIVISION

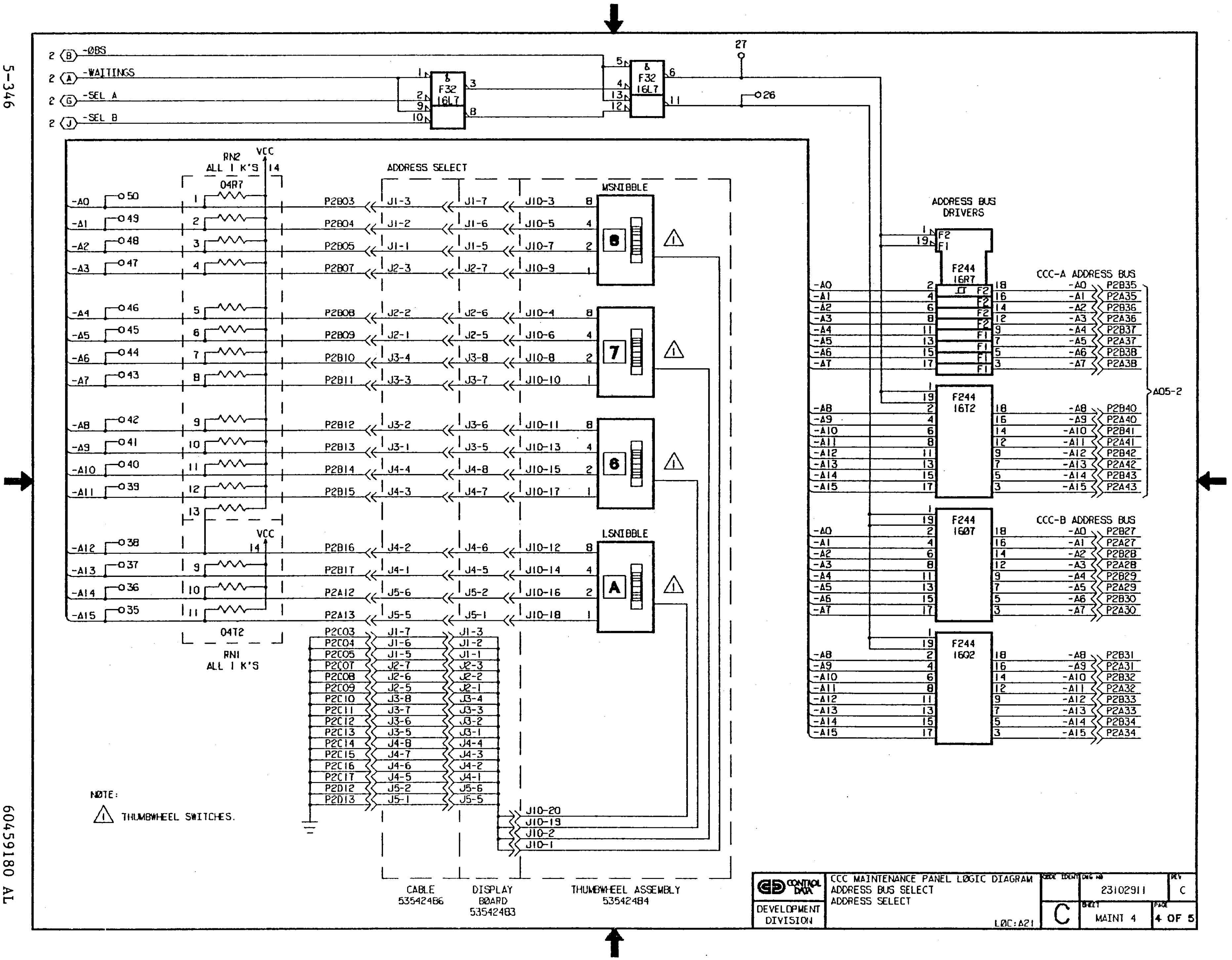
CCC MAINTENANCE PANEL LOGIC DIAGRAM
CONTROL,
CLOCK AND PARITY SELECT

LOC: A21

CODE IDENT	DWG NO	REV
C	23102911	C
	SHEET MAINT 2	PAGE 2 OF 5



CONTROL DATA	CCC MAINTENANCE PANEL LØGIC DIAGRAM SELECT DATA BUS. DATA BUS RECEIVERS. LATCH/DISPLAY ERR CØDE WRITTEN LED'S	CODE IDENT	DWG NO 23102911 · REV C
DEVELOPMENT DIVISION	LØC:A21	C	SHEET MAINT 3 · PAGE 3 OF 5

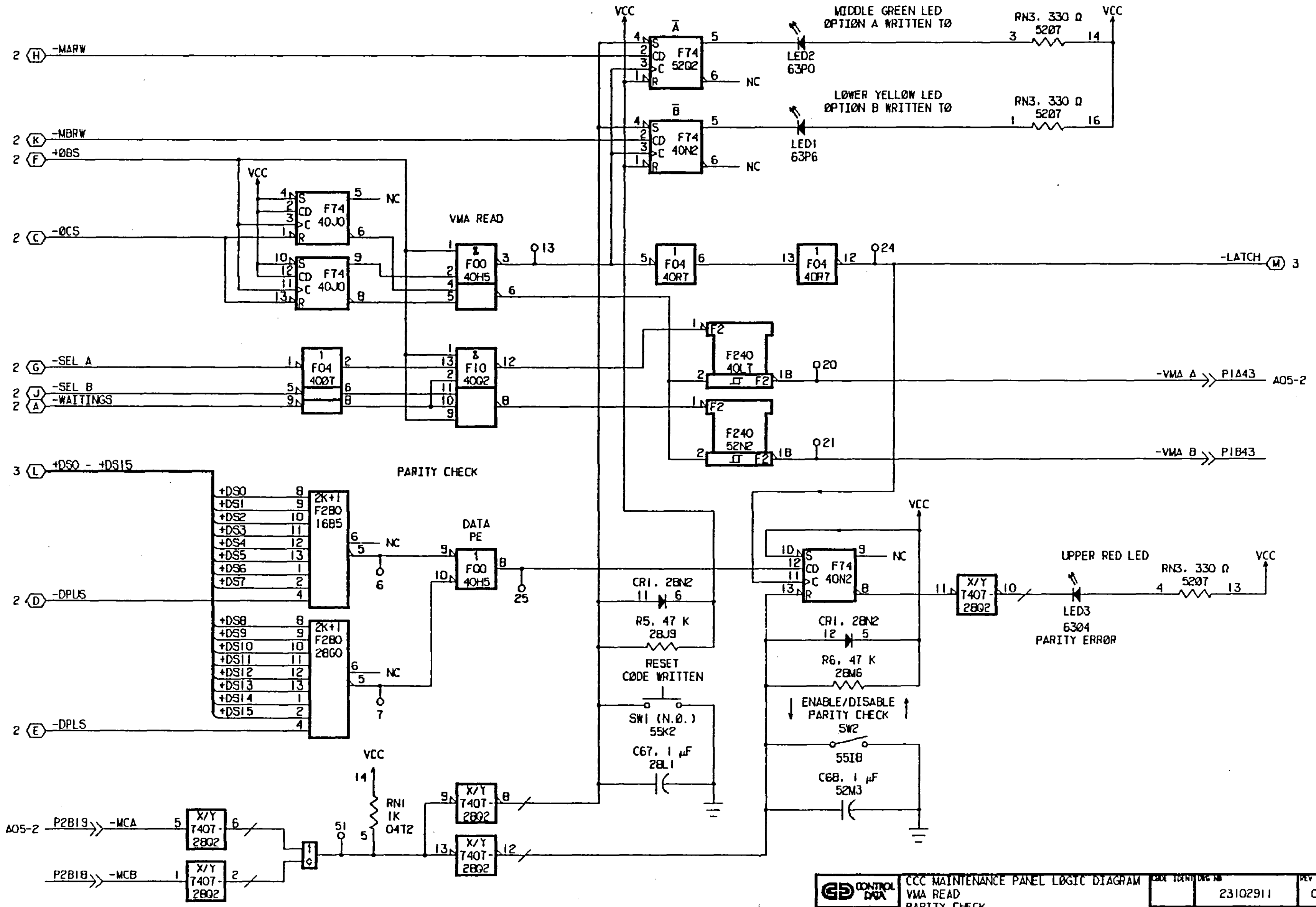


CONTROL DATA
DEVELOPMENT DIVISION

CCC MAINTENANCE PANEL LOGIC DIAGRAM
ADDRESS BUS SELECT
ADDRESS SELECT

LOC: A21

DWG NO 23102911
REV C
SIZE C
SHEET MAINT 4
PAGE 4 OF 5



CONTROL DATA DEVELOPMENT DIVISION	CCC MAINTENANCE PANEL LOGIC DIAGRAM VMA READ PARITY CHECK LOC:A21	CODE IDENT / DWG NO 23102911 C SHEET MAINT 5	REV C PAGE 5 OF 5

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PAGE					REVISION RECORD					
5	4	3	2	1	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	A	A	A	A	CA48097	CLASS A RELEASED	MES	8/25/86	NS	NS
B	B	B	B	B	CA48239	ADDED COVER. RE-INTERSHEET	MES	1/29/87	NS	NS
B	B	B	C	C	CA48643	SEE C O	MES	2/26/87	NS	NS

NOTES:

1. THIS DOCUMENT IS CONTAINED ON MAGNETIC TAPE. MAGNETIC TAPE IS STORED IN THE EDP GROUP OF ENGINEERING SERVICES SECTION.CDED DIVISION.
2. UPDATES TO LOGIC PRINTS MUST BE PERFORMED BY CALMA.
3. THE OFF SHEET SIGNAL REFERENCES DESIGNATE THE PAGE IN THE TITLE BLOCK AREA ON DIAGRAMS.

DETACHED LISTS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	M E SCHMIDT	05/86
CHKD	N ZAK	05/86
ENGR	R T HENNING	05/86
MFG	B J REILAND	05/86
APVD	R T HENNING	05/86

EQUIP. NO. FR205-A

THIRD ANGLE PROJECTION

CONTROL DATA

ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

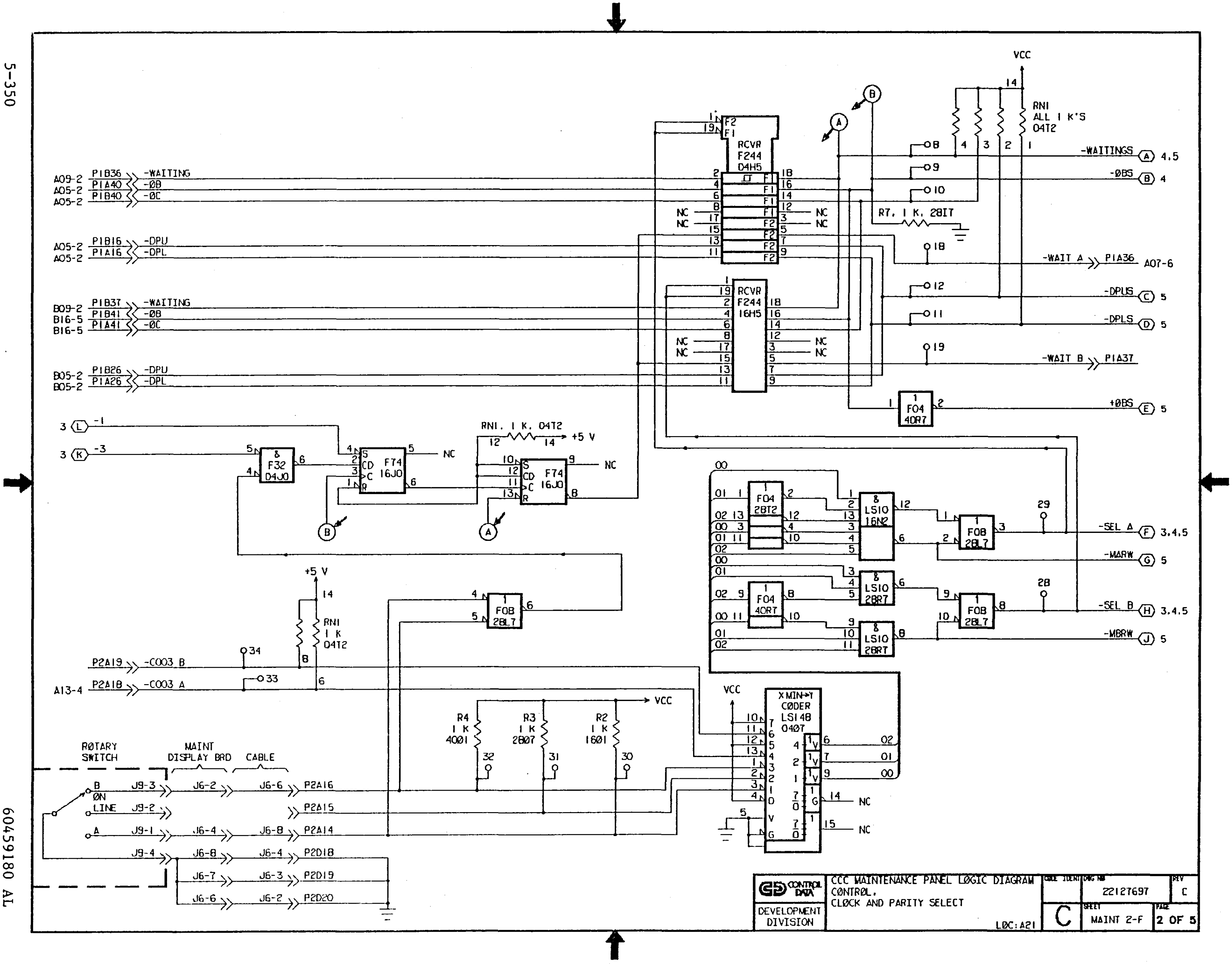
TITLE

LOGIC DIAGRAM
MAINTENANCE BOARD

PWA-22110276
PWB-53812429

SIZE C
FSCM NO. 34010
DWG NO. 22127697

LOC: A21
SHEET MAINT 1-F
PAGE 1 OF 5



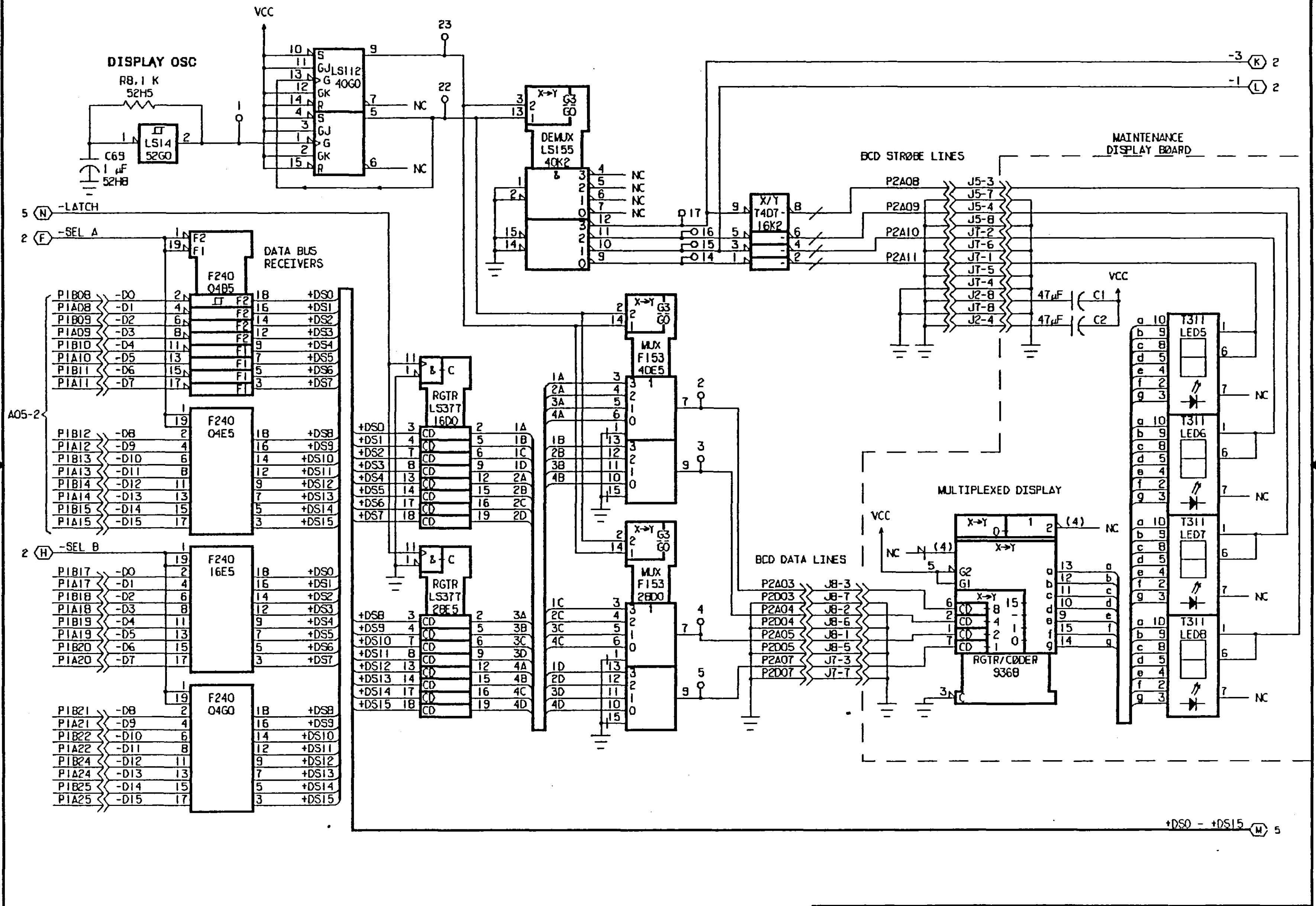
CONTROL DATA

DEVELOPMENT DIVISION

CCC MAINTENANCE PANEL LOGIC DIAGRAM
CONTROL,
CLOCK AND PARITY SELECT

LOC:A21

CODE IDENT	DWG NO	REV
C	22127697	C
	SHEET MAINT 2-F	PAGE 2 OF 5



CONTROL DATA

DEVELOPMENT DIVISION

CCC MAINTENANCE PANEL LØGIC DIAGRAM
SELECT DATA BUS, DATA BUS RECEIVERS,
LATCH/DISPLAY ERR CØDE WRITTEN LED'S
LØC: A21

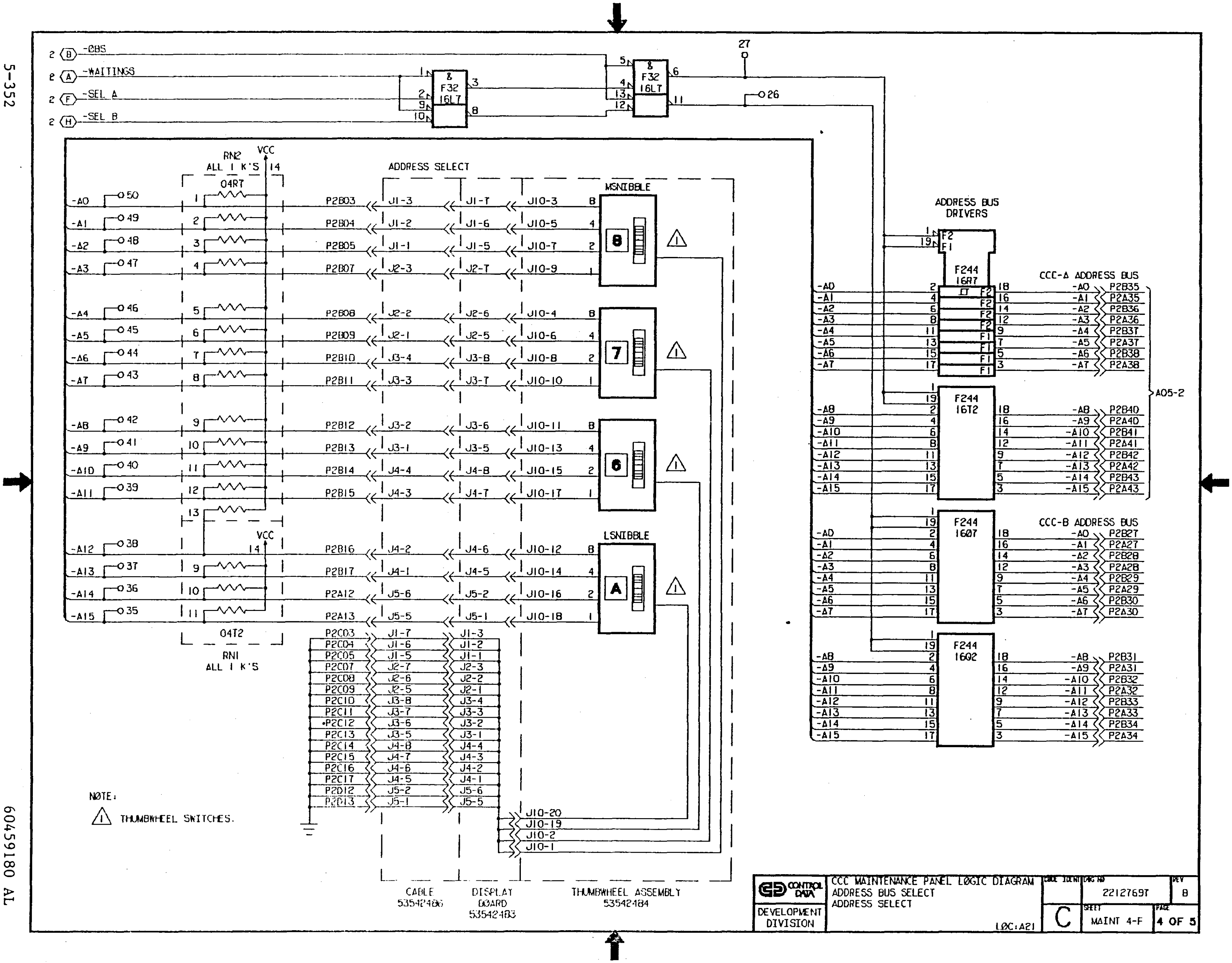
C

22127697

B

MAINT 3-F

3 OF 5



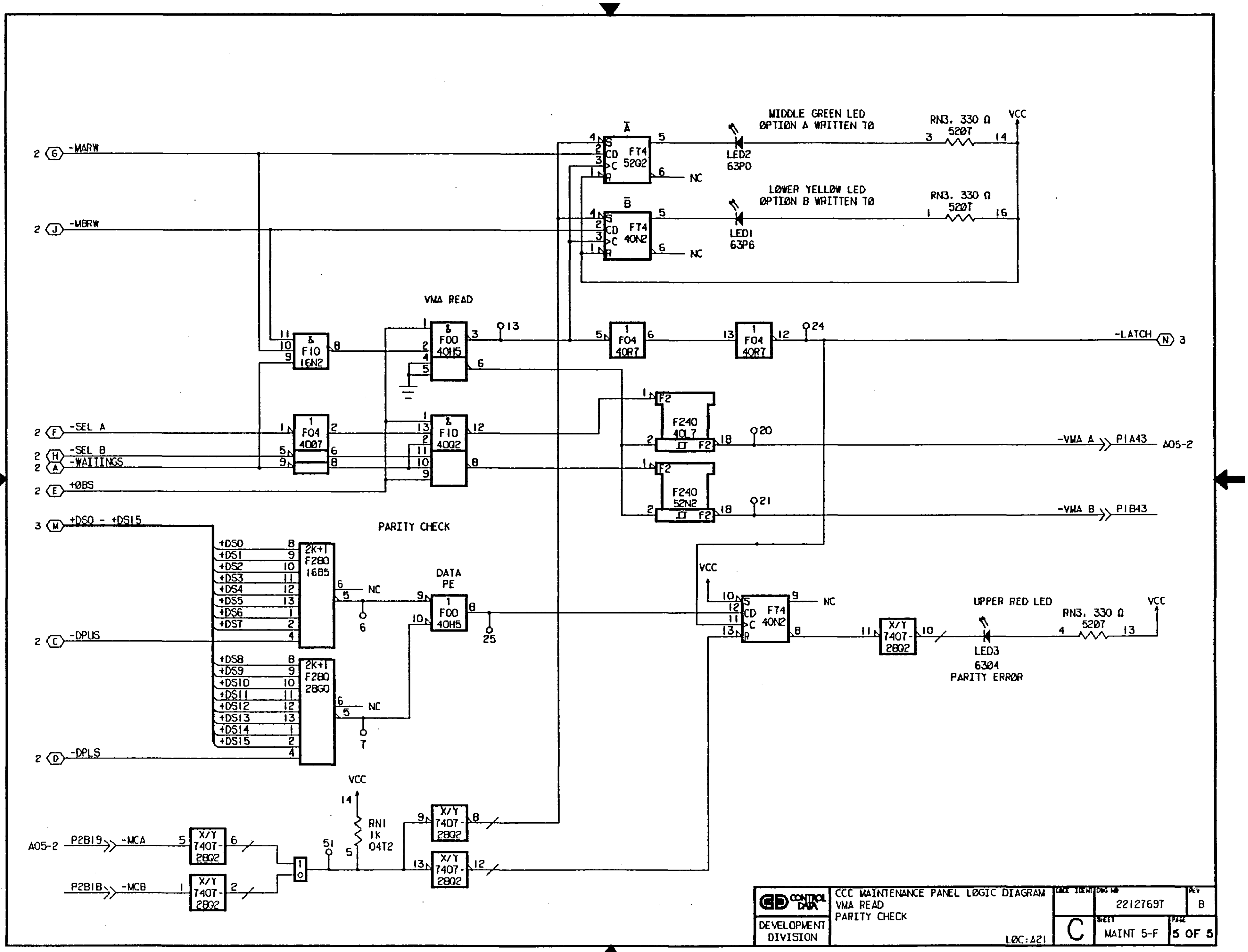
CONTROL DATA

DEVELOPMENT DIVISION

CCC MAINTENANCE PANEL LOGIC DIAGRAM
ADDRESS BUS SELECT
ADDRESS SELECT

LOC:A21

CODE IDENT	DWG NO	REV
C	22127697	B
	SHEET MAINT 4-F	PAGE 4 OF 5



CONTROL DATA	CCC MAINTENANCE PANEL LOGIC DIAGRAM VMA READ PARITY CHECK	CAGE IDENT	DWG NO 22127697	REV B
DEVELOPMENT DIVISION	LOC:A21	C	SHEET MAINT 5-F	PAGE 5 OF 5

POWER DISTRIBUTION DIAGRAM

400-HZ and 50/60-HZ INPUT POWER

The 400-Hz input power feeds the +5 V and -5 V logic power supplies A5, A6A3, and A6A1, and the 50/60-Hz input power is used to run blower motor A4B1.

When the POWER DISCONNECT 400-HZ circuit breaker (A7CB1) is placed in the ON position, one line of the 400-Hz power is routed to pin 5 of connector A4J1. This power is applied through high-temperature sensor A4A1S1 to relay A7XK1, and the relay energizes. This enables the same line of the 400-Hz power to be routed through a closed contact of relay A7XK1 to energize relay A7K3. All three lines of the 400-Hz power are now applied through circuit breaker A7CB1, and through the closed contacts of relay A7K3 to the +5 V and -5 V power supplies. Circuit breaker A7CB1 also provides overload protection for the power supplies.

Placing the POWER DISCONNECT 50/60-HZ switch (A7S1) in the ON position applies 50/60-Hz power to blower motor A4B1.

HIGH-TEMPERATURE SENSOR (A4A1)

Normal Operation

Under normal temperature conditions, 400-Hz current flows through resistor R1 and high-temperature sensor S1 and energizes relay A7XK1. This, in turn, enables relay A7K3 to energize and apply 400-Hz power to the +5 V and -5 V logic power supplies. Resistor R1 heats the high-temperature sensor S1, but airflow from blower B1 maintains the temperature around the sensor below 55 oC (130 oF).

HIGH-TEMPERATURE OPERATION

If the cabinet temperature rises to 55 oC (130 oF) because of blower failure or other reasons, current through resistor A4R1 causes the high-temperature sensor A4S1 to open. This removes 400-Hz power from relay A7XK1, and it deenergizes. This, in turn, enables relay A7K3 to deenergize and remove 400-Hz power from the logic power supplies to stop operation. Also when A7XK1 deenergizes, 400-Hz ground is applied through a closed contact of the relay to pin 4 of connector A4J1. This enables the 400-Hz power to light the AIRFLOW SENSOR RELAY INDICATOR (test lamp A4DS1).

Test Procedure

The high-temperature sensor may be checked for proper operation by pressing and holding the AIRFLOW SENSOR BLOWER OFF switch (test switch A4S1). This removes 50/60-Hz power from blower motor A4B1. Within approximately 1-1/2 minutes, the high-temperature sensor (A4A1S1) should open and cause the +5 V and -5 V logic power supplies to shut down and the AIRFLOW SENSOR RELAY INDICATOR to light. Release the AIRFLOW SENSOR BLOWER OFF switch. Place POWER DISCONNECT switch A7S1 in the OFF position for approximately 5 minutes and then back to the ON position to resume normal operation. If necessary, reset the POWER DISCONNECT 400-HZ circuit breaker (A7CB1).

METER CIRCUIT (A5A1)

The +5 V and -5 V power supplies apply power to the meter circuit. METER SELECTOR switch S1 selects either +5 V or -5 V as the input voltage to the zero percent meter M1. The meter is adjusted for a zero percent indication for both the +5 V and -5 V inputs with variable resistor R4. The 6-V and 12-V inputs and associated variable resistors R5 and R6 are not used.

CONVENIENCE OUTLET (A7J10)

This 120-V, 50/60-Hz outlet is protected only by the 7-A circuit breaker A7CB2. For this reason, it should be used only with low power electrical equipment drawing less than 7 A.

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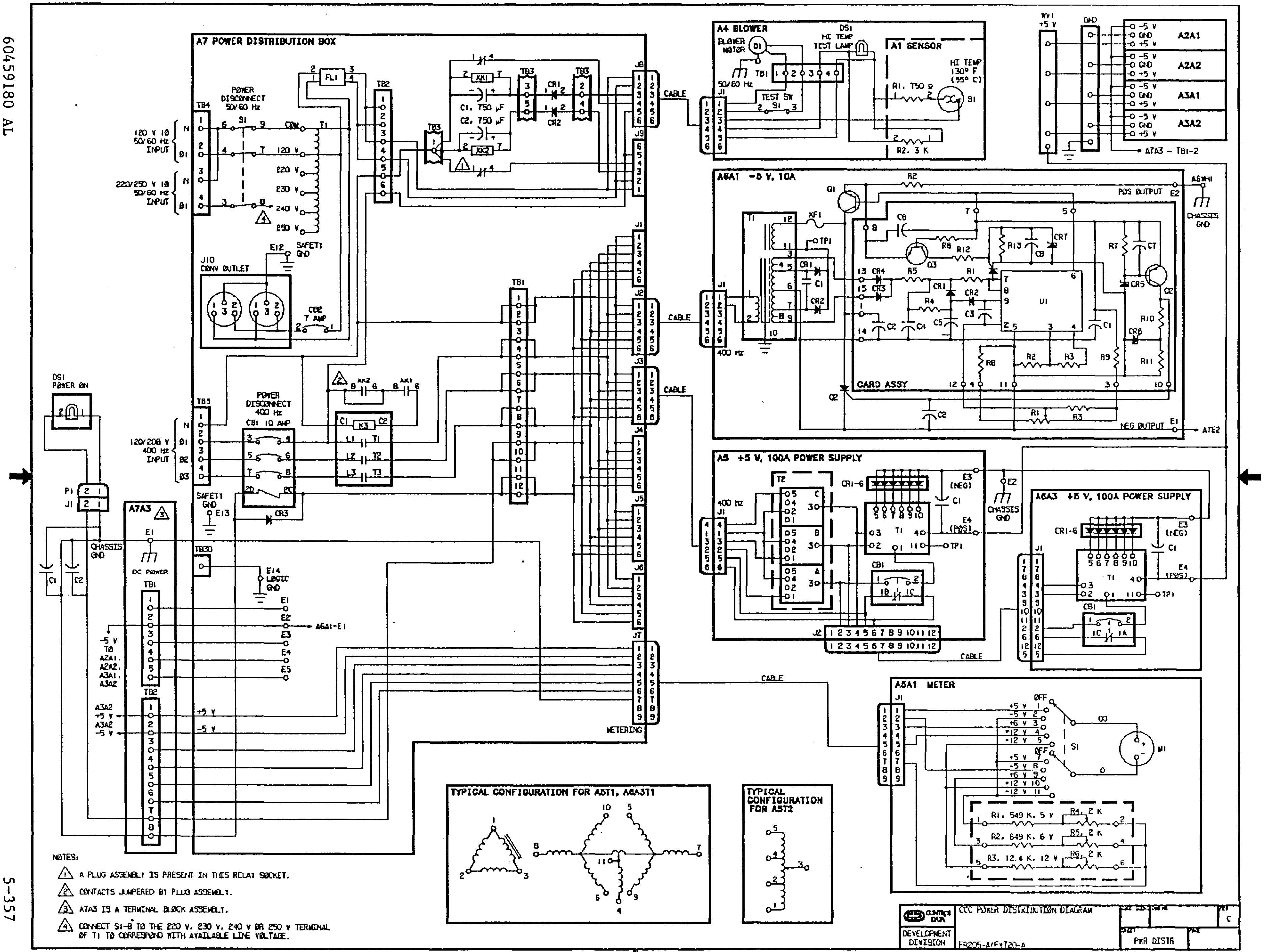


NOTES:

1. A PLUG ASSEMBLY IS PRESENT IN THIS RELAY SOCKET.
2. CONTACTS JUMPERED BY PLUG ASSEMBLY.
3. A7A3 IS A TERMINAL BLOCK ASSEMBLY.
4. CONNECT S1-8 TO THE 220 V, 230 V, 240 V OR 250 V TERMINAL OF T1 TO CORRESPOND WITH AVAILABLE LINE VOLTAGE.

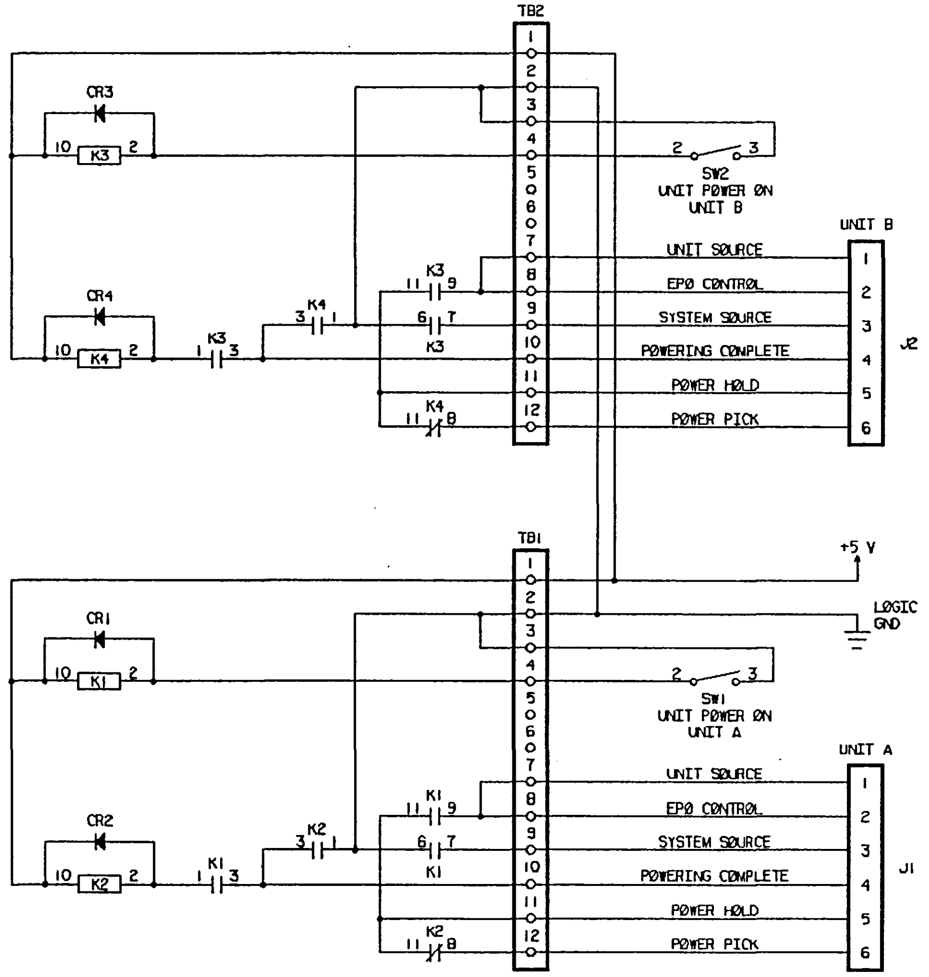
CONTROL DATA
DEVELOPMENT DIVISION
CCC POWER DISTRIBUTION DIAGRAM
FB205-A/FV720-A
REV C
PWR DISTR

CCC POWER INTERFACE DIAGRAM

When the UNIT A POWER-ON switch (SW1) is placed in the ON position, relay K1 energizes. This allows relay K1 contacts to close, which routes 24 volts dc from the CCC subsystem on the unit source line back to the CCC subsystem on the power hold line. The same closed contacts of relay K1 and normally closed contacts of relay K2 also route the 24 volts back to the CCC subsystem on the power pick line. Closed contacts of relay K1 also route coupler logic ground to the CCC subsystem on the system source line. The CCC subsystem then returns a ground signal on the powering complete line and relay K2 energizes. This allows the normally closed contacts of relay K2 to open and drop the power pick voltage to the CCC subsystem. In case the powering complete ground signal drops, relay K2 is held energized by a logic ground latch through closed contacts of relays K2 and K1. The emergency power off (EPO) control line from the CCC subsystem is not controlled by the coupler.

When the UNIT A POWER-ON switch (SW1) is placed in the OFF position, logic ground is removed from relay K1 and it deenergizes. Contacts of relay K1 open and drop 24 volts on the power hold line and logic ground on the system source line. Open contacts of relay K1 also deenergize relay K2 and the circuit completely shuts down.

The UNIT B POWER-ON circuit functions in the same manner as the UNIT A POWER-ON circuit.



NOTES:

1. SWITCHES SHOWN IN OFF POSITION.
   RELAYS SHOWN IN DEENERGIZED POSITION.

CONTROL DATA	CCC POWER INTERFACE DIAGRAM	CODE IDENT	DWG NO	REV C
DEVELOPMENT DIVISION		C	SHEET PWR INTFC	PAGE

MAINTENANCE 6

This section provides information to assist the customer engineer (CE) in troubleshooting and performing maintenance on the CYBER Channel Coupler (coupler). The material presented assumes a basic familiarity with the coupler, the CDC CYBER 170/180 Computer System, HPA, MALET, and DEMOT. Knowledge of basic maintenance techniques, including use of common CE tools and test equipment, is also required. The maintenance information covers checks, adjustments, removal, and replacement of the field-replaceable units as directed by the associated structured analysis method (SAM) listings for the coupler. Information is organized under the following major headings:

- General Maintenance Information
- Preventive Maintenance Task Procedures
- Maintenance Aids
- Explanation of SAM Format
- Organization of SAMs and Procedures
- SAM Listings (Subsection 6A)
- Procedures (Subsection 6B)

GENERAL MAINTENANCE INFORMATION

The following paragraphs provide general maintenance information that the customer engineer should be familiar with before troubleshooting and performing maintenance on the coupler. These are:

- Safety Precautions
- MOS Circuit-Handling Precautions
- Maintenance Tools and Materials

SAFETY PRECAUTIONS

WARNING

Observe the following safety precautions at all times. Failure to do so may cause equipment damage and/or personal injury.

- Hazardous voltages exist in the equipment cabinets. Do not attempt repair unless qualified to do so.

- Exercise caution any time checks or adjustments are being made with power applied to coupler.
- Always turn power off when removing/replacing components or cables.

MOS CIRCUIT-HANDLING PRECAUTIONS

CAUTION

> Special handling procedures are necessary for printed-circuit boards containing metal-oxide semiconductor (MOS) integrated circuits. These ICs are susceptible to damage from static electricity. Therefore, observe the following precautions when handling PC boards containing MOS circuits.

- Turn power off before removing/installing or otherwise connecting/disconnecting any circuits.
- Ensure that any item that comes in contact with the PC board is electrically grounded.
- Wear wrist ground straps to bleed off any accumulated static charge while handling or removing/installing PC board.
- Handle PC board only by a noncircuit portion of board. Connector pins and etched circuit paths must not be touched.
- Place PC board in a special conductive envelope whenever board is removed from chassis.

MAINTENANCE TOOLS AND MATERIALS

The maintenance procedures for the coupler only require the use of common CE hand tools and test equipment. No special test equipment, tools, or materials are required.

PREVENTIVE MAINTENANCE TASK PROCEDURES (PMTP)

Perform PMTP as instructed in the following CAMS listing.

PREVENTIVE MAINTENANCE TASK PROCEDURE FOR CAMS ID FR205

5000 CLEANING AND COOLING CHECKS

PERFORM THE AIRFLOW SENSOR TEST AS DEFINED IN THE CYBER CHANNEL COUPLER MAINTENANCE MANUAL 60459180. (SEE PROCEDURE 3 IN SECTION 6B OF MANUAL.)

ALSO PERFORM THE AIR FILTER CLEANING PROCEDURE DEFINED IN THE SAME MANUAL. (SEE PROCEDURE 4 IN SECTION 6B OF MANUAL.)

MAINTENANCE AIDS

Several maintenance aids are available to the customer engineer to assist in isolating and identifying the cause of faults within the coupler. The primary maintenance aids for fault isolation are the internal diagnostics, the down-line diagnostics, and the SAM troubleshooting listings. The SAMs are structured to isolate failures to field replaceable units (FRUs) based on diagnostic error codes and other fault symptoms that may be present. The SAMs also provide a procedure number reference to the applicable remove/replace/adjustment procedure that is to be used to correct the malfunction. The SAMs and remove/replace/adjustment procedures are contained in subsections 6A and 6B, respectively. Descriptions of the diagnostic tests and other maintenance aids available to the CE are described under the following headings:

- Coupler Internal Diagnostics
- Coupler Internal Diagnostic Error Codes
- Coupler Down-Line Diagnostics
- Peripheral Processor Diagnostic Functions
- CYBER Channel Interface Diagnostics Function
- 0070 FIPS Device I/F Diagnostics Function
- CYBER Channel Parity Error Detection and Processing
- Deadman Timer Feature
- Coupler Memory Locations
- Coupler Maintenance Panel
- HPA/MALET/DEMOT Execution

COUPLER INTERNAL DIAGNOSTICS

Three internal (PROM resident) self-test diagnostics are provided to test the coupler:

- CYBER channel interface diagnostic
- CYBER channel interface/processor interaction diagnostic
- FIPS device interface/processor interaction diagnostic

These diagnostics are executed sequentially following a power-on application, a master clear, during a 0070 channel interface diagnostics function from the PP, during a 0414 autoload coupler microcode from PP function, or during a 06uu autoload coupler microcode from disk function. If all of the diagnostic tests run without error, the processor is placed into an idle loop at location 8400, waiting for a function code from the PP. The internal diagnostic tests are described in the following paragraphs.

CYBER Channel Interface Diagnostic

The CYBER channel interface diagnostic tests the internal logic circuits of the CYBER channel interface. This diagnostic consists of seven sections (sections 0 through 6). At the start of each section, an interrupt corresponding to that section is set (for example, interrupt 0 is set for section 0). The interrupt flip-flops are not used by the internal logic in the coupler; however, they provide sync points for maintenance troubleshooting use. The flip-flops remain set until a master clear is received.

Switch SW1-5 on module A05 of the CYBER channel interface logic allows the microcode to loop on the internal diagnostic when placed in the ON position. If an error or end-of-test is detected and the switch is ON, the microcode repeats the diagnostic starting with section 0. If an error is detected and the switch is in the OFF positon, the microcode loops on an address (hangs).

Upon successful completion of the internal diagnostic with switch SW1-5 in the OFF position, the microcode turns off the CYBER channel interface diagnostic LED (LED 5 on the A05 module)- and jumps to the idle routine.

The following paragraphs briefly describe each of the diagnostic sections.

Section 0

Section 0 loads the address and length counters with all ones and zeros to check the length = 0 status. It then checks that decrementing the length does not increment the address and vice-versa. It also checks for simultaneously incrementing the address and decrementing the length.

Section 1

Section 1 loads the address counter with all zeros and the length counter with all ones. It then decrements the length counter to zero while incrementing the address counter and checks the address for nonzero. It also increments the address counter and checks for all zeros using length = 0 status.

Section 2

Section 2 starts with the address counter loaded with all zeros and does four pushes incrementing the address each time. It then moves the address value to the length counter and does four pops, decrementing the length counter each time. It checks for a length = 0 status after four pops.

Section 3

Section 3 checks all shift counts and tests each bit to ensure that a bit has not been inadvertently set. It then checks all shift counts and tests each bit to ensure that a bit has not been inadvertently cleared.

Section 4

Section 4 checks for constant assembly/disassembly clocks and also checks for missing assembly/disassembly clock pulses.

Section 5

Section 5 checks the bit setting and bit clearing capabilities using different shift counts to set and clear the same bit.

Section 6

Section 6 writes an address pattern in the register file and checks it using the address and length counters. It then loads the complement address pattern in the register file and checks it.

CYBER Channel Interface/Processor Interaction Diagnostic

This diagnostic tests the communication and interaction between the CYBER channel interface and the processor. The CYBER channel interface first loads the address counter with the contents of memory location 0021_{16} and reads 16 words into the register file. The CYBER channel interface then loads the address counter with the contents of memory location 0022_{16} and writes 16 words from the register file. If a memory parity error is detected while reading the op code or memory location 0021_{16}, no data is read. The CYBER channel interface sets bit 12 (control package parity error) in memory location 0024_{16}, lights the memory parity error LED (LED 3 on module A05), and returns to the idle routine.

If a memory parity error is detected while reading data, the CYBER channel interface attempts to write the data back into memory and sets bit 10 (memory parity error) in memory location 0024_{16}. If a memory parity is detected while reading memory location 0022_{16}, no data is written and the CYBER channel interface sets bit 12 (control package parity error) in memory location 0024_{16} and lights the memory parity error LED (LED 3 on module A05).

If a memory parity error is detected while reading data or while reading memory location 0022_{16}, both a control package parity error status (bit 12) and a memory parity error status (bit 10) is returned to the processor. If no errors are detected, the CYBER channel interface writes the data to memory and sends a normal end status (bit 8) to the processor.

FIPS Device Interface/Processor Interaction Diagnostic

This diagnostic tests the communication and interaction between the FIPS device interface and the processor. An initialization control sequence consisting of a system reset followed by a halt is performed prior to each test segment. The initialization control sequence stores the starting address of the test segment to be executed in address 0028, and clears the ending status contained in location 002A. Execution of the test segment begins by performing a write instruction at location E000. At the completion of each test segment, the ending status stored in address 002A is checked for a nonzero condition. Normal completion is indicated by bit 0 being set, and an error is indicated by bit 0 being clear with the error status contained in bits 4 through 15.

The diagnostic uses block multiplexer mode to load the transfer registers with various data patterns and read back each data pattern for comparison. The patterns tested are all ones, and alternating ones and zeros (using first 5555_{16}, then $AAAA_{16}$ patterns). Then the diagnostic performs a one-byte diagnostic write of all zeros, followed by a read block ID to verify that the data read back was correct. Next, a 256-byte buffer is written and verified by checking the block ID.

NOTE

> Data is not transmitted to the external peripheral device. Only the internal data path within the coupler itself is tested.

Finally, a diagnostic read operation is performed that reads and verifies 256 bytes of alternating ones and zeros generated by the internal microcode in the FIPS device interface. The patterns generated are $FFFF_{16}$ and 0000_{16}.

The diagnostic then tests the stream mode logic by first performing a diagnostic read during stream mode. This test segment inputs 256 bytes of data, stores the data patterns in memory, and checks the block ID to see that it is 18C. The patterns stored in memory are:

1st word	0001
2nd word	0203
3rd word	0405
Etc.	
to	
Last word	FEFF

A diagnostic write operation is then performed while in stream mode that generates the same patterns as above and the block ID is again checked for an 18C value. Note that the receivers and transmitters are not actually checked during the stream mode test segments as no data is looped back; only the block IDs are checked.

COUPLER INTERNAL DIAGNOSTIC ERROR CODES

The coupler generates and returns to the PP various error codes detected by the internal diagnostics. The internal diagnostics are run during an autoload coupler microcode from PP function (0414), an autoload coupler microcode from disk function (06uu), during a channel interface diagnostics function (0070), and during a power-on or pushbutton master clear. For most internal coupler diagnostic errors, the coupler returns a general status of 5XXX to the PP, where XXX is the octal error code. An error code in hexadecimal is also sent to the coupler maintenance panel for display. The error codes generated for the maintenance panel display and for general status are described as follows:

NOTE

> Error codes 1301_{16} through 1373_{16} are derived from the CYBER channel trace tables. See appendix A for additional information. Also, refer to the tabulation following this listing for definitions of error codes ending with X. For example, 805X indicates error codes 8051 through 805F inclusive.

Maintenance Panel (Hexadecimal)	General Status (Octal)	Error Description
1000		Processor is stopped.
1301 - 130A		CYBER channel I/F diagnostic error, section 0.
1311, 1312		CYBER channel I/F diagnostic error, section 1.
1321 - 1325		CYBER channel I/F diagnostic error, section 2.
1331 - 1338		CYBER channel I/F diagnostic error, section 3.
1341 - 1348		CYBER channel I/F diagnostic error, section 4.
1351, 1352		CYBER channel I/F diagnostic error, section 5.
1361		CYBER channel I/F diagnostic error, section 6.
1371		Control package memory parity error.
1372		Memory parity error.
1373		Length not 0 after memory read to RF and RF read to memory write.
8000		Start ROM resident diagnostics, command test failed.
8001		Memory test for CYBER and channel I/F failure.
8002		ROM checksum failure, location 8000_{16} to $87FF_{16}$.
8003		ROM checksum failure, location 8800_{16} to $8FFF_{16}$.
8004		CYBER I/F interaction test, function time-out.
8005		CYBER I/F interaction test, memory parity error.
8006		CYBER I/F interaction test, control package parity error.
8007		CYBER I/F interaction test, data miscompare.
8040	5100	Equipment switch settings (SW1-2, SW1-3, and SW1-4 on A05 module of the coupler) do not indicate a valid equipment type.
805X	5121 - 5137	Normal end did not set in the ending status word after a load transfer registers function.
806X	5141 - 5157	Normal end did not set in the ending status word after a read transfer registers function.
8070	5160	Transfer registers data miscompare.
807X	5161 - 5177	Normal end did not set in the ending status word after a diagnostic write sequence.
8080	5200	Full/Empty counter is incorrect after a diagnostic write sequence.

Maintenance Panel (Hexadecimal)	General Status (Octal)	Error Description
808X	5201 - 5217	Normal end did not set after a read block ID function.
8090	5220	Block ID is incorrect after a diagnostic write sequence.
809X	5221 - 5237	Normal end did not set in the ending status word after a diagnostic read function.
80A0	5240	FIPS address is incorrect after a diagnostic write function.
80A8	5250	Diagnostic read pattern is incorrect.
80A9	5251	Transfer register error after a diagnostic read function.
80AA	5252	Block ID is wrong after a diagnostic read function.
80AB	5253	FIPS interface sequence did not complete.
80AC	5254	Data stream diagnostic read time-out.
80AD	5255	Data stream diagnostic write time-out.
80BX	5261 - 5277	Data stream diagnostic read status is not normal end.
80C0	5300	Data stream diagnostic read block ID is wrong.
80CX	5311 - 5327	Data stream diagnostic write status is not normal end.
80D8	5330	Data stream diagnostic write block ID is wrong.
8101	5401	System reset error occurred after checksum during autoload from PP function.
8102	5402	CYBER interface status error occurred after an autoload from PP function.
8103	5403	RAM checksum error occurred after autoload.
8140	5404	RAM memory test error occurred before the autoload from PP function started.
8141	5501	Seek or recalibrate sequence time-out from disk device.
8141	5101	Equipment switches set wrong.
8142	5502	Recalibrate or seek error from disk device.
8143	5503	Seek sequence ending status error from disk device.
8144	5504	Search error from disk device.
8145	5505	Read data error from disk device.
8147	5507	System reset sequence error from disk device.

Maintenance Panel (Hexadecimal)	General Status (Octal)	Error Description
8148	5110	Normal end not set in ending status after select sequence.
8148	5510	Search/read sequence time-out from disk device.
8149	5111	Normal end not set in ending status after load transfer registers.
814A	5112	Normal end not set in ending status after read transfer registers.
814B	5113	Transfer register data miscompare.
814C	5114	Normal end not set after diagnostic write sequence.
814F	5117	Full/empty count incorrect after diagnostic write.
8150	5120	SCU address incorrect after diagnostic write.
8151	5121	Normal end not set after read block ID.
8152	5122	Block ID wrong after diagnostic write.
8154	5124	Normal end not set after diagnostic read.
8156	5126	Diagnostic read data pattern incorrect.
8157	5127	Transfer register error after diagnostic read.
8158	5130	Block ID wrong after diagnostic read.
816D	5155	SCU I/F sequence did not complete.
8200	5600	System reset sequence error.
8201	5601	Initial select/rewind sequence error.
8202	5602	Can not locate controlware record error.
8203	5603	Input controlware record error.
8204	5604	RAM controlware checksum error.
8205	5605	Final select/rewind sequence error.
8800	0000	Normal completion of internal diagnostics. (ROM idle loop.)
8810	0000	Autoload from PP started.
8820	0000	Autoload from disk device started.
8840	0000	Autoload completed (ROM resident).
8888	0000	Autoload completed.

Hardware error codes ending in X indicate the following:

X =	Error Definition
1	Write path parity error upper (1F09, bit 10 set)
2	Write path parity error lower (1F09, bit 2 set)
3	Memory parity error
4	Bus in parity error and read path parity error
5	Read path parity error
6	Bus out fault (1F08, bit 3 set)
7	Tag out fault upper (1F08, bit 4 set)
8	Tag out fault lower (1F08, bit 9 set)
9	Flag bit detected
A	Minimum block length not met
B	Select in received
C	No request in on poll sequence
D	Device address miscompare
E	Time-out on FIPS transfer
F	Not used

COUPLER DOWN-LINE DIAGNOSTICS

The following diagnostics (CLM, CCM, NDM, and NDP) are down-line loaded from the PP to the coupler. These diagnostics provide more extensive testing of the coupler than can be performed by the internal (self-test) diagnostics.

CLM - Diagnostic Loader/Monitor

CLM is the loader and monitor program for the down-line diagnostics. It is used to load, start, and monitor execution of these tests. The following restrictions apply: The test to be executed must be contained on the system file called "scratch" before a run command is given to CLM. Also, any test parameters must be entered before CLM is started, or the test will execute using default parameters.

After CLM starts execution of a diagnostic test, the monitor then checks the CCC memory locations containing the test status. All changes in the test status are checked by the monitor and made available to the user via the KL display, terminal display, or the print file. All errors detected during test execution due to I/O problems or hardware problems cause the test and the monitor to stop, and the error is reported. Two types of errors are possible: errors detected by CLM such as channel problems, no test on the system scratch file, or parameter problems; and errors detected by the test itself. Depending on the type of error, the user may or may not be able to continue test execution.

The various error messages reported by CLM are as follows:

- CLM00 - Parameter Error Detected
- Processor Error on Master Clear - A compare error was detected when coupler memory locations 4 through F were read. This indicates that an error occurred during the master clear process. The user can continue test execution at own risk. The contents of addresses 4 through F are displayed during this error.
- TTTMM Stopped on Error - This message indicates that a test error has occurred and that the test has stopped. TTTMM is the name of the test/module that stopped.

- Error MMMMMMMMMMMMMMMMMMM - This indicates that the test has stopped due to an error detected by the test. MMMMM...M is the test error message. Error message format is as follows:

  EC=EEEE ECNT=CCCC ICNT=IIII

  ADDR=AAAA EXP=EXXX ACT=RRRR

  Hardware Status=HHHH

Where:	
EEEE	Error code (see E0002, E0003, E0004, and E0005 below)
CCCC	Error count
IIII	Iteration count
AAAA	Coupler address where failure occurred
EXXX	Expected contents of failing address
RRRR	Actual contents of failing address
HHHH	Coupler hardware status
E0002	Channel Parity Error. The channel detected a parity error while data was being transferred across the CYBER channel.
E0003	Test Loaded Incorrectly. The one-word verify process failed. This indicates that the complete test does not reside in CCC memory.
E0004	Test Not in System File. Before the test is downloaded to the coupler, the loader checks to see if the coupler test was written into the system "scratch" file by looking for the 77 header table. This error message is reported if the 77 header table cannot be found.
E0005	In-line Diagnostic Error. Prior to downloading a test to the coupler, the in-line diagnostics are executed. If the diagnostics complete properly, but the general status received is not equal to zero, then this error is reported.

- Clear RM to Terminate Test - This message alerts the user that the repeat module switch must be turned off before the test is terminated. If the RM switch is left on, the loader/monitor module keeps repeating.

- CCC In-Line Failure - No Response Within 500 ms - The in-line diagnostics were invoked by sending a zero length autoload command to the coupler and no response to the function was received within 500 ms. This indicates that the coupler is in a hung condition.

CCM - Coupler Memory Test

CCM is a memory test for the coupler. The test resides in a peripheral processor and tests the memory of the coupler. The test does not use the processor in the coupler. During execution, the processor is stopped. The execution time for this test is approximately 50 s.

NOTE

This test destroys the coupler microcode in the coupler being tested.

This test consists of the following test modules:

CCM00 -	Tests the parameter words entered and verifies that they are valid for the coupler being tested.
CCM01 -	Verifies the DMA read and write data paths to memory by passing data to and from coupler memory through use of microcode functions.
CCM02 -	Tests the coupler memory using data patterns of all ones and all zeros.
CCM03 -	Tests the coupler memory using data patterns of 5555_{16} and $AAAA_{16}$.
CCM04 -	Tests the coupler memory using an 8-bit sliding-zero data pattern. (Using FDFD, FBFB, F7F7, EFEF, DFDF, BFBF, and $7F7F_{16}$ data patterns.)
CCM05 -	Tests the coupler memory using an 8-bit sliding-one data pattern. (Using 0101, 0202, 0404, 0808, 1010, 2020, 4040, and 8080_{16} data patterns.)
CCM06 -	Tests the addressing capabilities of the coupler memory.
CCM07 -	Tests the coupler memory using random data patterns.

The following display formats are used by CCM to report errors to the user:

- Parameter Entry Errors:

```
CCM - CCC Memory Test
CCMNN - (M............T)
CCMNN Suspected Parameter Error
(E................D)
P0 - P4  PPPP PPPP PPPP PPPP PPPP
P5 - P9  PPPP PPPP PPPP PPPP PPPP
```

Where:	
NN	Module number
M.....T	Module title
E.....D	Description of the error
PPPP	Contents of the parameter word (P0 and P2 through P9 are not used. P1 = 0000 = Default value for 16K memory size. P1 = 0001 = 16K)

- Product Overlay Errors:

```
CCM - CCC Memory Test
CCMNN - (M............T)

CCMNN Aborted on (C............M)
    Last function = FFFFB  WT = WWWB
CCMNN  EXXXXB  LYYYB  (E............M)
```

Where:	
NN	Module number
M.....T	Module title
C.....M	Command on which the abort occurred
FFFF	Last function issued to the coupler
WWWW	Words transferred during last data transfer
XXXX	The error code in octal
YYY	The EA register when the error occurred
E.....M	Verbal description of the error code

- Memory Data Errors:

```
CCM - CCC Memory Test
CCMNN - (M............T)
CCMNN Aborted on (C............M)
CCMNN  EXXXXB  LYYYB  (E............M)
ADRS    EXP.    ACT.    DIF. (hexadecimal values)
AAAA    BBBB    CCCC    DDDD
AAAA    BBBB    CCCC    DDDD
AAAA    BBBB    CCCC    DDDD
AAAA    BBBB    CCCC    DDDD
AAAA    BBBB    CCCC    DDDD
AAAA    BBBB    CCCC    DDDD
AAAA    BBBB    CCCC    DDDD
AAAA    BBBB    CCCC    DDDD
```

Where:

NN	Module number
M............T	Module title
C............M	Command on which the abort occurred
XXXX	The error code in octal
YYY	The EA register when the error occurred
E............M	Verbal description of the error code
AAAA	The failing address in the coupler memory
BBBB	The expected contents of the memory location
CCCC	The actual contents of the memory location
DDDD	The logical difference of BBBB and CCCC

NDM - CCC Memory Test

NDM is a memory data test for the coupler. It is designed to detect failing bits and failing addresses in the coupler memory. The diagnostic is loaded into the coupler memory and checks memory through use of the processor access. The NDM diagnostic for the coupler consists of seven test modules that get progressively more complex. These are described as follows:

NOTE

> This test destroys the downline-loaded coupler microcode in the coupler being tested.
>
> A memory parity error causes the processor in the coupler to stop. The processor status is stored in memory locations 4 through F_{16} in the processor memory.

Module 0 - Quick look test. Tests the low memory locations. Addresses are read only; no write operations take place.

Module 1 - Write and read data test. Checks for data and parity errors. The following data patterns are written throughout memory, then read. All 0s, all 1s, all 5s, and all A's.

Module 2 - Data equal address test. Loads addresses to be tested with data that equals the address value. These addresses are then read and checked for a miscompare.

Module 3 - Sliding one and zero test. Takes the starting address and sets bit 0. The data is then complemented for that address, and tested again. A right shift of one is performed and that address is tested again. This process continues until all bits in the address have been tested. This sequence is repeated for each address tested.

Module 4 - Marching data test. Loads all memory to be tested with zeros. Then each address is read and $FFFF_{16}$ is written in that address. After all addresses have had this operation performed, the $FFFF_{16}$ data pattern is read and zeros are then written. Any data miscompares are reported.

Module 5 - Relocatable test. Takes the portion of the NDM test that starts at address 200_{16} (excludes the low-memory addresses) and relocates it to upper memory starting at address 3000_{16}. Then a marching data test is run on addresses 200_{16} through $2FFF_{16}$. When testing is complete, NDM is relocated back to its original address locations.

Module 6 - Random data test. Condition 1 generates a random data pattern for each address. When all of memory is written, each address is then read and a compare is performed to see that the random number read from each address is the same as the number generated for it. Condition 2 generates a random address, and then a random number is written in that address. This address is then read and verified.

The following error codes and messages are reported:

Error Code	Error Message
01	Data miscompare error. The data pattern written does not equal the data read.
02	Data-not-equal-to-address error. The data read from a location did not equal the address of that location.
03	SCDT miscompare error. A sliding bit in an address being written and then complemented had a miscompare.
04	MDT miscompare error. A machine data test where complemented data (zeros and ones) was written and then read from an address location and a data miscompare occurred.
05	Random data error. The random data written in an address did not compare with the data read from that address.
06	Random addressing data error. The random data written at a random address had a miscompare when read back.
07	Memory size error. The memory size set in parameter P1 is not valid. Accepted parameters are: 0 or 1 = 16K, 2 = 24K, 3 = 32K, 4 = 40K, 5 = 48K, 6 = 56K, 7 = 64K.

NDP - CCC Processor Test

NDP is a processor instruction test for the processor contained in the coupler. It is designed to detect failing instructions in the processor of the coupler. NDP contains a quick-look test and 63 test modules. The quick-look test is a confidence test of the coupler processor instructions. It is executed before any of the 63 test modules. The module test sequence is structured to test the simplest instructions first, and then gradually test the more complex instructions. A fixed set of operands is used to test some parts of the coupler processor such as the ALU and shift network. The code conversion instruction uses a canned set of random operands to test this instruction.

If NDP detects an error during execution of the quick-look diagnostic or if the processor detects a memory parity error, the processor is stopped and the status conditions are stored in locations 4 through F_{16} of the processor memory. The monitor program (CLM) detects the quick-look error condition and displays the contents of locations 4 through F_{16}.

Refer to the CLM loader/monitor diagnostic description for the format used for error messages.

PERIPHERAL PROCESSOR DIAGNOSTIC FUNCTIONS

Seven PP diagnostic functions are decoded by the CYBER channel interface independent of processor instructions and are not part of the microcode or firmware. The operation (Op) codes for these functions are listed in octal notation and described in the following paragraphs:

- X5XX - Load Address and Length
- X701 - Read
- X702 - Write
- X704 - Status
- X710 - Stop
- X720 - Go
- X740 - Master Clear

X5XX - Load Address and Length

This function allows the PP to activate the channel and output one or two data words. The lower 4 bits (XX) of the function are loaded into the upper 4 bits of the 16-bit address register. The first word sent by the PP is loaded into the lower 12 bits of the address register to complete its loading. The second word sent by the PP is loaded into the lower 12 bits of the 16-bit length register while the upper 4 bits are zero-filled. The channel interface responds only to the first two words sent by the PP and a hung channel may result if the PP attempts to send additional words. This function also clears register file 1 (status).

X701 - Read

This function allows the PP to activate the channel and input the length count times two words. The upper 8 bits of the 16-bit word referenced by the address register are transferred as the lower 8 bits of the first 12-bit channel word while the upper 4 bits are zero-filled. The lower 8 bits of the 16-bit word are transferred in the same manner as the upper 8 bits. The address is incremented, the length decremented, and the PP input process continues until the CYBER channel interface inactivates the channel when the length equals zero. The PP may terminate the operation early if desired. The address and length must be loaded prior to sending this function in order for data to be valid. A check for memory parity errors is made at the end of the data transfer and the results are logged in register file 1 (status).

X702 - Write

This function allows the PP to output the desired number of words. Only the address register is loaded by diagnostic function X5XX while the length register is not used. The lower 8 bits of the first 12-bit word received by the coupler are loaded into the upper 8 bits of a holding register. The lower 8 bits of the second 12-bit word are loaded into the lower 8 bits of the holding register. The contents of the holding register are then sent to memory. This process continues for additional words sent by the PP. The word transfer is terminated by an inactive signal from the channel. The address register must be loaded prior to every X702 function received by the coupler to ensure that data is written into the correct memory location. If an odd number of words are received from the channel, the lower 8 bits of the last word sent to memory are zero-filled.

X704 - Status

This function allows the PP to activate the channel and input one word of status from register file 1. The CYBER channel interface inactivates the channel after it sends the status word. This word contains the following status bits:

NOTE

Bit 11 is the most significant bit.

Bit 11 - Normal end
Bit 10 - Channel parity error
Bit 9 - Memory parity error
Bit 8 - Deadman timeout
Bit 7 - Control package parity error
Bit 6 - Transfer indicator
Bit 5 - Character fill
Bit 4 - Not used
Bit 3 - Length equals zero
Bit 2 - DMA complete
Bit 1 - Processor running
Bit 0 - Processor abnormal

Bits 5 through 11 reflect the last status sent to memory location 0024_{16} following a processor operation. Diagnostic function X5XX clears bits 5 through 11. Only bits 8 through 10 of these bits are valid for diagnostic purposes as the others are processor-controlled bits. Bits 0 through 3 are dynamic status bits which indicate the state of the logic at the time the function is received.

X710 - Stop

This function causes the processor to stop running.

X720 - Go

This function allows the processor to start running.

X740 - Master Clear

This function clears processor and device interface logic.

CYBER CHANNEL INTERFACE DIAGNOSTIC FUNCTIONS

The CYBER channel interface has two separate paths through which PP data can reach the coupler memory. One path uses the Universal Device Interface (UDI) module and assembles data under microcode control. The other path uses Direct Memory Access (DMA) to assemble data under hardware control. The following functions are used to test these paths. The octal function codes are not given as they differ for the various devices that may be attached to the coupler. Refer to the specific subsystem user's guide for the applicable function codes.

- UDI Read
- UDI Write
- DMA Read
- DMA Write

UDI Read

The UDI read function allows the PP to read 322 12-bit words from the coupler memory. This function uses the same hardware path as the status functions. The coupler outputs the 12 rightmost bits of each 16-bit memory word. It can be used to read the data previously written with the UDI write function.

UDI Write

The UDI write function allows the PP to write 322 12-bit words into the coupler memory. This function uses the same hardware as functions that send parameters. The 12-bit channel word is stored in the 12 rightmost bits of the 16-bit memory word. General status is 5000 if there is a channel parity error or less than 322 words are received by the coupler. A general status of zero indicates the function completed without error.

DMA Read

The direct memory access read function allows the PP to read 322 12-bit words from the coupler memory. It uses the same hardware path as the read function (0004). The 322 12-bit words are stored in the 8 leftmost bits of the 16-bit words in the 483-word coupler memory buffer. This buffer contains the last record written to the disk, read from the disk, or written by the DMA write function. A general status of zero indicates the function completed without error.

DMA Write

The direct memory access write function allows the PP to write 322 12-bit words into the coupler memory. It uses the same hardware path as the write function (0005). The 322 12-bit words are stored in the 8 leftmost bits of the 16-bit words in the 483-word coupler memory buffer. A general status of zero indicates the function completed without error.

0070 FIPS DEVICE I/F DIAGNOSTICS FUNCTION

The 0070 FIPS device I/F diagnostics function is used to test the FIPS device interface logic circuits. This function allows the PP to run the same FIPS device interface diagnostics that are run during a full-autoload coupler microcode from PP function (0414). The diagnostic tests include loading and reading the transfer registers, loading and reading conversion tables transmitting fixed data patterns from memory to the transmitters, and transmitting fixed data patterns from the receivers to memory. If the diagnostic executes without error, the general status returned to the PP is zero. If an error is detected, the general status is 5XXX, where XXX is an error code. (Refer to the listing of coupler internal diagnostic error codes that are described under Maintenance Aids, earlier in this section.)

CYBER CHANNEL PARITY ERROR DETECTION AND PROCESSING

CYBER channel parity errors are detected on all PP functions and all PP read/write operations to the coupler. The types of channel parity errors and their methods of processing are described in the following paragraphs.

Channel Parity Error on Function from PP

The coupler does not reply to a function from the PP having a parity error. The PP must time out the function to avoid hanging the channel. After the time-out, the PP should disconnect the channel and resend the function to the coupler. The operation must be aborted if parity errors continue.

Parity Error on PP Write

The PP completes the write operation in a normal manner after detection of a parity error on a PP write function. The PP should then send a general status function (0012) to the coupler. The coupler microcode prepares the status words in its memory and a general status of 5000 is returned to the PP. The PP should then send a extended detailed status function (0023) to the coupler and the coupler responds with bit 6 of detailed status word 18 set to indicate a write parity error. The PP should resend the write function and parameters or data to recover from the parity error. The operation must be aborted if parity errors continue.

NOTE

If parity errors occur during general or extended detailed status functions, refer to the Parity Error on Function from PP and Parity Error on PP Read paragraphs.

Parity Error on PP Read (Parameters or Data)

The PP should test the appropriate bit in the status and control register after the data block input. This must be done prior to sending the next function. The coupler microcode does not detect a parity error on a PP read, and only general status indicates a coupler error. The PP must take one of the following actions after detecting the parity error:

- Resend the function and reread the parameters or data.
- Reseek and read the record.
- Reseek and read the block of records.
- Abort the operation if parity errors continue.

DEADMAN TIMER FEATURE

The coupler hardware incorporates a deadman timeout feature that prevents the PP channel from hanging for an extended period of time. The deadman timer is enabled for all functions that transfer data between the PP and the coupler. Each time a Full or Empty signal is transferred across the channel, the deadman timer is reset to zero and the time-out period is reinitiated. When the PP inactivates the channel, the deadman timer is set to zero. If a data transfer hangs up, a time-out period of 7 to 10 seconds expires and an Inactive signal is sent to the PP.

For read/write functions to the disk, DMA write operations, and DMA read operations, the microcode prevents deadman timeouts. If the data transfer does not complete or the channel does not get inactivated for these functions, the microcode inactivates the channel. General and detailed status describe the error.

For the remaining functions that transfer words between the PP and the coupler (connect, seek, format pack, and UDI write), the deadman timer is used. A general status of 5000 and a deadman timeout status in detailed status word 18 is returned for these functions if the deadman timer unhangs the channel.

COUPLER MEMORY LOCATIONS

The following coupler memory locations provide pertinent status and operating information that can be examined by the customer engineer during troubleshooting. Refer to the CYBER Channel Coupler Hardware Reference Manual listed in the preface for additional information on these addresses.

Processor Addresses

Address	Contents
0004_{16}	Read Data
0005_{16}	Current Instruction
0006_{16}	P Register
0007_{16}	A Register
0008_{16}	B1 Register
0009_{16}	B2 Register
$000A_{16}$	S1 Register
$000B_{16}$	S2 Register
$000C_{16}$	S3 Register
$000D_{16}$	S4 Register
$000E_{16}$	Status

CYBER Channel I/F Control Package Addresses

Address	Contents
0020_{16}	Op Code
0021_{16}	Address
0022_{16}	Length
0023_{16}	Function
0024_{16}	Status
0025_{16}	Coupler Identification

FIPS Device I/F Control Package Addresses

Address	Contents
0028_{16}	Starting Address of FIPS Control Sequence ($1C00_{16}$)
0029_{16}	Device Address
$002A_{16}$	Control Sequence Ending Status
$002B_{16}$	Control Sequence Execution Address
$002C_{16}$	Request In
$002D_{16}$	Ending Status for Aborted FIPS Transfer
$002E_{16}$	Delay Count
2000_{16}	Buffer Starting Address

COUPLER MAINTENANCE PANEL

The coupler maintenance panel provides a means for reading memory locations from either the FR205 or FV720 coupler. To use, first place the selector switch in the ON-LINE position. Next, use the thumbwheel assembly to dial in the desired memory address to be read. Then, place the selector switch to either the A (for FR205) or B (for FV720) position to read the contents of the memory address specified. This stops the processor, and the memory contents appear in the four-digit alphanumeric display in hexadecimal notation. Successive memory locations may be read by dialing in the desired addresses on the thumbwheel assembly. Return the selector switch to the ON-LINE position when through. This restarts the processor.

The ON-LINE position of the selector switch allows the maintenance panel to be a memory mapped display shared by either coupler. That is, either coupler can write to the display. However, the FR205 coupler has priority over the FV720.

Maintenance Panel Logic Board

The maintenance panel logic board at location A21 contains three LED indicators, a toggle switch, and a pushbutton switch. The toggle switch is used to enable or disable odd parity checking (enabled when down, disabled when up). The top LED on the PC board indicates a parity error when lit. If the FV720 writes to the alphanumeric display, the middle LED lights. If the FR205 writes to the alphanumeric display, the bottom LED lights. During a detected error, the LED of the last coupler to write into the alphanumeric display remains lit.

HPA/MALET/DEMOT EXECUTION

The following paragraphs provide information for running HPA (Hardware Performance Analyzer) to obtain equipment and media performance reports, and to execute diagnostics under MALET (Maintenance Application Language for Equipment Testing), and DEMOT. MALET is part of the Concurrent Maintenance Library (CML) and DEMOT is part of the Maintenance Software Library (MSL).

HPA Execution

HPA runs under the network operating system (NOS). The following steps provide a rudimentary method for running HPA to obtain an intervention report. Refer to the HPA User Reference Manual listed in the preface for complete HPA information.

1. Execute HPA by typing in the following information for the network operating system (NOS).

   ```
   X.DIS.
   USER,username,password,family.
   CHARGE,account parameters.
   GETLOG.
   NORM.
   HPA.
   *
   ```

2. Examine the HPA output listing for a system-related intervention report.

3. Use the PP channel/equipment/drive numbers from the intervention report when running diagnostics if the equipment status table (EST) ordinal for the equipment is not known.

MALET/DEMOT Execution

MALET is a computer maintenance language that runs under NOS. The coupler down-line diagnostics can be executed online under MALET. DEMOT provides similar capabilities in the offline environment. The following paragraphs describe typical methods of placing MALET and DEMOT in execution and assigning a drive for testing. The two on-line MALET procedures require that the following conditions to be satisfied before starting. Refer to the CML Reference Manual listed in the preface for additional MALET information.

- Before executing MALET, the operating system must be placed in engineering mode by typing the following commands at the system console according to NOS.

  ```
  UNLOCK.
  ENGR.  or  ENABLE, ENGR.
  LOCK.
  ```

  When diagnostic activity is complete, the operating system should be taken out of engineering mode by retyping the appropriate commands listed above.

- MALET requires a GO,jsn command from the operator before executing any of the following coupler diagnostics: CLM, CCM, NDM, or NDP.

- On some sites, access to individual diagnostics that run under MALET requires that the user identification at run time be identical to the identification used when the diagnostics were stored.

MALET (On-Line) Execution from Remote Terminal

NOTE

> This procedure assumes that the coupler diagnostics are already stored on the system disk. If not, refer to the CML Reference Manual listed in the preface for information necessary to store the diagnostics.

Perform the following steps to execute on-line diagnostics from a remote terminal using MALET:

1. Telephone the computer site and explain that you will be running MALET diagnostics on the coupler. Ask the computer operator to place the operating system in engineering mode and to issue a GO,jsn command at your job's control point when requested by console message.

2. Log in to IAF (NOS) according to site-determined procedure.

3. Type one of the following sets of commands.

- To run NDM or NDP, type all of the following commands:

```
ATTACH,NDP. (or NDM)

ATTACH,RFILE=CLM.

MALET(T=line length)

ASSIGN,EST=est,AL=3 (when the equipment has an EST entry) or

ASSIGN,EST=NO,CH=ch,EQ=0,UN=un,AL=10,DC=dc (when equipment has no EST entry)

(WAIT. operator must give a Go)

P,XXXXX. (depending on the test)

SCRATCH=NDP. (or NDM)

R,CLM.
```

- To run CCM, type all of the following commands:

```
ATTACH,RFILE=CCM.

MALET(T=line length)

ASSIGN,EST=est,AL=3 (when the equipment has an EST entry) or

ASSIGN,EST=NO,CH=ch,EQ=0,UN=un,AL=10,DC=dc (when equipment has no EST entry)

(WAIT. operator must give a Go)

P,XXXXX. (depending on the test)

R,CCM.
```

MALET (On-Line) Execution from Local Console

NOTE

> This procedure assumes that the coupler diagnostics are already stored on the system disk. If not, refer to the CML Reference Manual listed in the preface for information necessary to store the diagnostics.

To execute the NDM and NDP on-line diagnostics from the local system console using MALET, type in the following NOS entry. (This procedure runs both tests).

Preparing the test file:

```
    X.DIS.
    user#.
    GET,NDP,NDM. (indirect file) or ATTACH,NDP,NDM. (direct file)
    GET,RFILE=CLM. (indirect file) or ATTACH,RFILE=CLM (direct file)
    MALET,KL.
    DROP.
    K,cp#. (control point number in NOS 1) or K,JSN. (NOS 2)
    K.A,EST=40,AL=5,DC=XX.
```

Running the tests:

```
        K.SCRATCH=NDP.
        K.R,NLM.
```

when NDP completes, enter:

```
        K.SCRATCH=NDP.
        K.R,NLM.
```

To execute the CCM online diagnostics from the local system console using MALET, type in the following NOS entry:

```
    X.DIS.
    user#.
    GET,RFILE=CCM. (indirect file) or ATTACH,RFILE=CCM. (direct file)
    MALET,KL.
    DROP.
    K,cp#. (control point number in NOS 1) or K,JSN. (NOS 2)
    K.A,EST=40,AL=5,DC=dc.
    cp#.GO. (NOS 1) or GO,JSN. (NOS 2)
    K.R,CCM.
```

DEMOT (Off-Line) Execution from Local Console

Perform the following steps to execute diagnostics off-line using DEMOT. Refer to the MSL Reference Manual listed in the preface for additional DEMOT information.

1. Mount MSL tape on tape unit.

NOTE

When used with a 66X tape subsystem, this procedure assumes that tape microcode is loaded and intact. If not, perform coldstart procedure described in the MSL Reference Manual listed in the preface.

2. Press Deadstart button under console display.

3. Check default system configuration assignments on initial display.

   - If communication channel assignments (ordinals 6, 7, and 8) conflict with disk channel(s), change system configuration by typing n. entry. For example, to change ordinal 6 to channel 05, type

     ```
     6.05.
     ```

   - MSL may be transferred from tape to disk at this time using one of the tape-to-disk utilities (TDX,TDY,TDZ) described in the MSL Reference Manual listed in the preface. The tape-to-disk MSL transfer takes approximately 20 minutes.

     When the transfer completes, press deadstart button under console display and then change system configuration ordinals 11 through 17 to enable common maintenance software executive (CMSE) loading from the appropriate drive.

4. Press carriage return (CR) to load CMSE.

5. Type

   ```
   *OV,2000.
   ```

   to place the CMSE overlay in central memory.

6. If microcode is already loaded in the coupler, go to step 7. Otherwise, load microcode as follows:

   ```
   CW,name,ch.  (name = CDC microcode deck name from disk, and ch = channel number
                of coupler)
   ```

7. Type one of the following command strings to bring up DEMOT from disk or tape.

   ```
   Disk:   *DP,OUTPUT
           CP*4,MCX,0,5
           CP*5,MLD,0,5
           RU*4,100
           SQ*77,1,4  (Needed only when using CMSE command buffers)
           PP*4
           DEMOT
           RU*5,100
           SQ*77,1,4  (Needed only when using CMSE command buffers)

   Tape:   CP*4,MCX,0,5
           CP*5,MLD,0,5
           RU*4,101
           SQ*77,1,4  (Needed only when using CMSE command buffers)
           PP*4
           DEMOT
           RU*5,101
   ```

8. Type

```
ASSIGN,CH=ch,UN=un,AL=20,DC=dc.
```

to assign a coupler for testing.

9. Type

```
PARAM,PX=YYYY.
```

as required.

10. Type

```
RUN,CCM.
```

Storing Controlware

There are two methods for storing microcode as a permanent file on the system disk:

- Extracting microcode from the operating system tape.
- Copying microcode from the MAxxx Install Tape.

Execute the following to extract microcode from the operating system deadstart tape:

```
NOS: jobname,T100.
     USER,username,password,family.
     CHARGE,account parameters.
     REQUEST,file,NT,D=PE,F=I,LB=KU.
     DEFINE,MAxxx/CT=PU,M=R.
     GTR,file,MAxxx.PPU/ISD.
     REWIND,file.
     DEFINE, COS.
     GTR,file,COS.PPU/CMD.
     6/7/8/9
```

Execute the following to copy microcode from the MAxxx Install Tape:

```
NOS: jobname,T100.
     USER,username,password,family.
     CHARGE,account parameters.
     REQUEST,file,D=PE,F=SI,LB=KU.
     DEFINE,MAxxx/M=W.
     COPYBR,file,MAxxx.
```

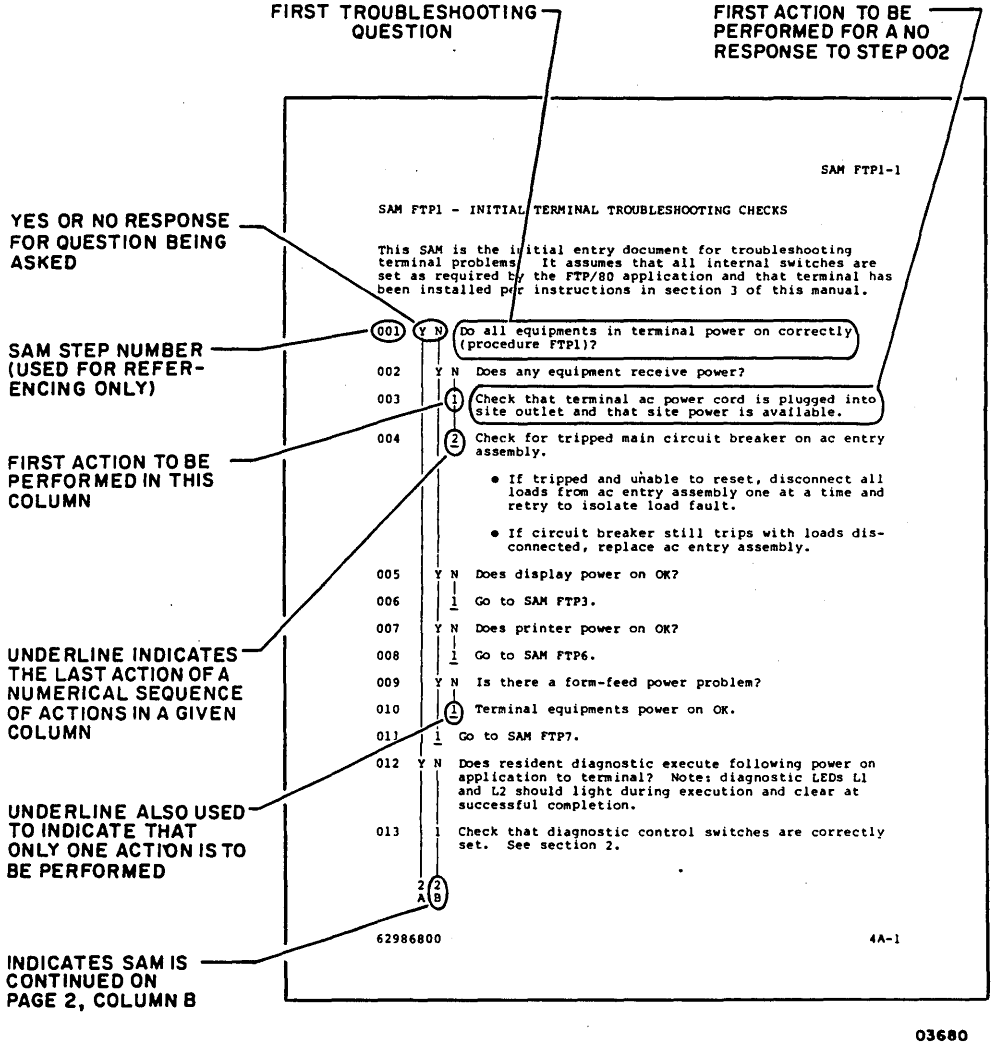
EXPLANATION OF SAM FORMAT

The Structured Analysis Method (SAM) is used in this manual to present troubleshooting information in a logical sequence of maintenance tasks. Figure 6-1 illustrates the basic SAM format. The SAM poses questions that, when answered, lead the user to a corrective action (or sequence of actions) to be performed. The corrective actions are organized such that the action most likely to fix the problem is listed first. If more than one action is equally probable to correct the malfunction, the action requiring the least amount of time is listed first. The purpose of the SAM as well as any applicable assumptions or advisory information is provided at the beginning of the SAM document.

To interpret a SAM, start at the top of the first page and determine the response for the first question posed. Then follow the appropriate line beneath the Y or N response. Answer the next question, etc., until the action numbers are reached. Perform the action(s) listed in that column in numerical order to correct the malfunction. A line under an action number indicates that it is the last corrective action to be performed for that particular malfunction.

ORGANIZATION OF SAMS AND PROCEDURES

Two separate subsections are used for the SAMs and the remove/replace/adjust procedures. These are: section 6A for the SAMs and section 6B for the Procedures.



FIRST TROUBLESHOOTING QUESTION
FIRST ACTION TO BE PERFORMED FOR A NO RESPONSE TO STEP 002
YES OR NO RESPONSE FOR QUESTION BEING ASKED
SAM STEP NUMBER (USED FOR REFERENCING ONLY)
FIRST ACTION TO BE PERFORMED IN THIS COLUMN
UNDERLINE INDICATES THE LAST ACTION OF A NUMERICAL SEQUENCE OF ACTIONS IN A GIVEN COLUMN
UNDERLINE ALSO USED TO INDICATE THAT ONLY ONE ACTION IS TO BE PERFORMED
INDICATES SAM IS CONTINUED ON PAGE 2, COLUMN B
03680

SAM FTP1-1

SAM FTP1 - INITIAL TERMINAL TROUBLESHOOTING CHECKS

This SAM is the initial entry document for troubleshooting terminal problems. It assumes that all internal switches are set as required by the FTP/80 application and that terminal has been installed per instructions in section 3 of this manual.

```
001  Y N  Do all equipments in terminal power on correctly
          (procedure FTP1)?
002    Y N  Does any equipment receive power?
003      1  Check that terminal ac power cord is plugged into
            site outlet and that site power is available.
004      2  Check for tripped main circuit breaker on ac entry
            assembly.

             • If tripped and unable to reset, disconnect all
               loads from ac entry assembly one at a time and
               retry to isolate load fault.

             • If circuit breaker still trips with loads dis-
               connected, replace ac entry assembly.

005    Y N  Does display power on OK?
006      1  Go to SAM FTP3.
007    Y N  Does printer power on OK?
008      1  Go to SAM FTP6.
009    Y N  Is there a form-feed power problem?
010      1  Terminal equipments power on OK.
011    1  Go to SAM FTP7.
012  Y N  Does resident diagnostic execute following power on
          application to terminal? Note: diagnostic LEDs L1
          and L2 should light during execution and clear at
          successful completion.
013    1  Check that diagnostic control switches are correctly
          set. See section 2.

     2 2
     A B

62986800                                             4A-1
```

Figure 6-1. SAM Format Example

SAMS

SECTION 6A

SAM 1 - ENTRY SAM FOR COUPLER PROBLEMS

This SAM is the first-level, or entry-level, SAM for isolating coupler problems. It provides information to direct the customer engineer to the appropriate SAM that should be performed for detailed fault isolation.

001 N Y Does the coupler fail to power up correctly?

002 1 Go to SAM 2, Power Fault Isolation.

003 N Y Do the internal coupler diagnostics fail to execute following a coupler power application or coupler master clear?

004 1 Replace PC boards in the following order: Chassis locations 09 and 08.

005 N Y Is there an internal coupler diagnostic test error? (Following a coupler power application or coupler master clear.)

006 1 Go to SAM 3, Internal Diagnostic and Trace Table Errors.

007 N Y Is there a coupler down-line diagnostic test error? (CLM, CCM, NDM, and NDP diagnostic tests.)

008 1 Go to the applicable SAM for the particular down-line diagnostic test as follows: SAM 4 for test CLM, SAM 5 for test CCM, SAM 6 for test NDM, and SAM 7 for test NDP.

009 N Y Is there a coupler autoload problem?

010 1 Check I/O cables between coupler and PP.

011 2 Verify that the correct microcode identification number and revision number are stored in the following RAM locations of coupler:

$003C_{16}$ last four digits of microcode ID (in hexadecimal)
$003D_{16}$ microcode revision number (in hexadecimal)

012 3 Go to SAM 3 and execute the internal diagnostics for additional error isolation.

013 1 Go to the beginning of this SAM and recheck all conditions to see if any fit the symptoms present. If not, try running the internal diagnostics and/or the down-line diagnostics to aid in isolating the problem. Refer to the Maintenance Aids portion of section 6 for a description of the various coupler diagnostic tests available.

******

SAM 2 - POWER FAULT ISOLATION

This SAM provides information to troubleshoot power faults within the coupler.

```
001  N Y  Is ac input power missing at the coupler?
     | |
002  | 1  Check/reset any wall-mounted circuit breakers feeding the coupler.
     |
003  N Y  Is AIRFLOW SENSOR RELAY INDICATOR lit? (Indicates that high temperature switch
     | |  in airflow sensor has opened and deenergized relays supplying 400-Hz power.
     | |  Allow time for unit to cool before performing the following steps.)
     | |
004  | 1  Check that 50/60-Hz POWER DISCONNECT switch is in ON position. (Supplies power
     | |  to blower assembly.)
     | |
005  | 2  Check/clean air filter (procedure 4).
     | |
006  | 3  Perform airflow sensor test (procedure 3) and replace sensor if faulty (procedure
     | |  10).
     | |
007  | 4  Check/replace blower switch (procedure 12).
     | |
008  | 5  Check/replace blower assembly (procedure 11).
     | |
009  | 6  Perform 50/60-Hz power fault isolation (procedure 5).
     |
010  N Y  Is there an over-temperature condition, but AIRFLOW SENSOR RELAY INDICATOR does
     | |  not light?
     | |
011  | 1  Perform airflow sensor test (procedure 3) and replace components as indicated.
     |
012  N Y  Is 400-Hz circuit breaker on power distribution panel tripped?
     | |
013  | 1  Reset 400-Hz circuit breaker.
     | |
014  | 2  Perform 400-Hz power fault isolation (procedure 6).
     |
015  N Y  Is circuit breaker CB1 tripped on either of the +5 V power supplies?
     | |
016  | 1  Reset CB1 circuit breaker.
     | |
017  | 2  Replace appropriate +5 V power supply (procedure 16).
     |
018  N Y  Is fuse F1 blown on -5 V power supply?
     | |
019  | 1  Replace fuse.
     | |
     | |
     2 2
     A B
     A B
     1 1
     | |
     | |
020  | 2  Replace -5 V power supply (procedure 16).
     |
021  N Y  Does percentage meter pointer remain at left side of scale when measuring either
     | |  +5 V or -5 V?
     | |
022  | 1  Perform 400-Hz power fault isolation (procedure 6).
     |
023  N Y  Is TEST EQUIPMENT circuit breaker (CB2) tripped on power distribution panel?
     | |
024  | 1  Unplug any power cords plugged into convenience outlet and reset circuit breaker
     |    CB2. (External equipment may be drawing more than 7 A.)
     |
     1    For other power problems, refer to the power distribution diagram in section 5, and
          troubleshoot accordingly.
```

SAM 3 - INTERNAL DIAGNOSTIC AND TRACE TABLE ERRORS

This SAM is for isolating errors detected by the internal diagnostics and the CYBER channel microcode trace tables of the coupler. The internal diagnostics can be run either off-line or on-line. Refer to section 6 for descriptions of the various internal diagnostic tests. Also refer to appendix A for information on the CYBER channel trace tables, to section 2 for a description of the diagnostic LEDS contained on the PC boards, and to procedure 24 in section 6B for logic card replacement information.

NOTE

> To run the internal coupler diagnostics off-line, perform the following steps: (If CYBER channel I/O cables are not connected, the 10-MHz clock is not present; therefore, remove PC board at location 01 in order to run the diagnostics. Note that the CYBER channel logic is not tested with the PC board removed.)
>
> 1. Place A, ON-LINE, B selector switch on coupler maintenance panel to ON-LINE position.
> 2. Press pushbutton master clear switch on PC board at location A05 or B05 of coupler to be tested. (Or apply power to coupler per procedure 1.)
> 3. Observe DATA/CODE display on maintenance panel for a detected error code or a successful completion code of 8800_{16}. (8800_{16} indicates successful completion only if no LEDs remain lit on PC boards.)

The SAM format for the error code information is as follows:

Error code $\underline{8041}_{16}/\underline{101}_{8}$ (General Status $\underline{5101}_{8}$)

Displayed on coupler maintenance panel	Displayed on CRT during on-line operation	General status returned to PP during on-line operation

001 N Y Error code 1000_{16} displayed? (Processor is stopped.)

002 | 1 Verify that the A, ON-LINE, B selector switch on coupler maintenance panel is in the ON-LINE position.

2 2
A B

A B
1 1

003 2 Replace PC boards in the following order: Chassis locations 08 and 09.

004 N Y Error code of 1101$_{16}$ through 1106$_{16}$ displayed? (Derived from the CYBER channel trace tables; see appendix A.)

005 1 Replace PC boards in the following order: Chassis locations 04, 02, 05, and 01. (PC board at location 01 may require tuning; refer to Clock Tuning Procedure in section 3.)

006 N Y Error code of 1301$_{16}$ through 1348$_{16}$ displayed? (Derived from the CYBER channel trace tables; see appendix A.)

007 1 Replace PC boards in the following order: Chassis locations 04, 02, 05, and 01. (PC board at location 01 may require tuning; refer to section 3.)

008 N Y Error code 8000$_{16}$ displayed?

009 1 Replace PC boards in the following order: Chassis locations 08 and 09.

010 N Y Error code 8001$_{16}$ displayed?

011 1 Replace PC board at chassis location 10.

012 N Y Error code 8002$_{16}$ displayed?

013 1 Replace PC board at chassis location 13.

014 N Y Error code 8003$_{16}$ displayed?

015 1 Replace PC board at chassis locations 10 and 13.

016 N Y Error code 8004$_{16}$ displayed?

017 1 Replace PC boards in the following order: Chassis locations 01, 02, 04, 05, 08, and 09. (PC board at location 01 may require tuning; refer to section 3.)

018 N Y Error code 8005$_{16}$ displayed?

019 1 Replace PC board at chassis location 10.

020 2 Replace each of the remaining PC boards one at a time.

021 N Y Error code 8006$_{16}$ displayed?

022 1 Replace PC board at chassis location 02.

3 3
A B

A B
2 2

023 | 2 Replace each of the remaining PC boards one at a time.

024 N Y Error code 8007_{16} displayed?

025 | 1 Replace PC boards in the following order: Chassis locations 02, 04, and 10.

026 N Y Error code $8040_{16}/100_8$ displayed? (General status 5100_8.)

027 | 1 Set equipment type in switches SW1-2, SW1-3, and SW1-4 on PC board at chassis location 05. (These switches specify equipment type connected to coupler.)

028 N Y Error code $8051_{16}/121_8$ displayed? (General status 5121_8.)

029 | 1 Replace PC boards at chassis locations 17 and 19.

030 N Y Error code $8052_{16}/122_8$ displayed? (General status 5122_8.)

031 | 1 Replace PC boards at chassis locations 18 and 19.

032 N Y Error code $8053_{16}/123_8$ displayed? (General status 5123_8.)

033 | 1 Replace PC board at chassis location 10.

034 N Y Error code $8054_{16}/124_8$ displayed? (General status 5124_8.)

035 | 1 Replace PC board at chassis location 19.

036 N Y Error code $8055_{16}/125_8$ displayed? (General status 5125_8.)

037 | 1 Replace PC board at chassis location 19.

038 N Y Error code $8056_{16}/126_8$ displayed? (General status 5126_8.)

039 | 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

040 N Y Error code $8057_{16}/127_8$ displayed? (General status 5127_8.)

041 | 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

042 N Y Error code $8058_{16}/130_8$ displayed? (General status 5130_8.)

043 | 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

044 N Y Error code $8059_{16}/131_8$ displayed? (General status 5131_8.)

4 4
A B

A B
3 3

045 | 1 Check seating/condition of Bus Out and Tag Out cables.

046 N Y Error code $805A_{16}/132_8$ displayed? (General status 5132_8.)

047 | 1 Replace PC boards at chassis locations 14, 19, and 16.

048 N Y Error code $805B_{16}/133_8$ displayed? (General status 5133_8.)

049 | 1 Replace PC board at chassis location 19, check Bus Out/Tag Out cables, and check external device.

050 N Y Error code $805C_{16}/134_8$ displayed? (General status 5134_8.)

051 | 1 Replace PC board at chassis location 16, check Bus Out/Tag Out cables, and check external device.

052 N Y Error code $805D_{16}/135_8$ displayed? (General status 5135_8.)

053 | 1 Replace PC board at chassis location 02, check Bus Out/Tag Out cables, and check external device.

054 N Y Error code $805E_{16}/136_8$ displayed? (General status 5136_8.)

055 | 1 Replace PC boards at chassis locations 18, 16, and 17; check Bus Out/Tag Out cables; and check external device.

056 N Y Error code $805F_{16}/137_8$ displayed? (General status 5137_8.)

057 | 1 This error code is not used.

058 N Y Error code $8061_{16}/141_8$ displayed? (General status 5141_8.)

059 | 1 Replace PC boards at chassis locations 17 and 19.

060 N Y Error code $8062_{16}/142_8$ displayed? (General status 5142_8.)

061 | 1 Replace PC boards at chassis locations 18 and 19.

062 N Y Error code $8063_{16}/143_8$ displayed? (General status 5143_8.)

063 | 1 Replace PC board at chassis location 10.

064 N Y Error code $8064_{16}/144_8$ displayed? (General status 5144_8.)

065 | 1 Replace PC board at chassis locations 19.

066 N Y Error code $8065_{16}/145_8$ displayed? (General status 5145_8.)

067 | 1 Replace PC board at chassis locations 19.

5
A

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4

068 N Y Error code $8066_{16}/146_8$ displayed? (General status 5146_8.)

069 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

070 N Y Error code $8067_{16}/147_8$ displayed? (General status 5147_8.)

071 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

072 N Y Error code $8068_{16}/150_8$ displayed? (General status 5150_8.)

073 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

074 N Y Error code $8069_{16}/151_8$ displayed? (General status 5151_8.)

075 1 Check seating/condition of Bus Out and Tag Out cables.

076 N Y Error code $806A_{16}/152_8$ displayed? (General status 5152_8.)

077 1 Replace PC boards at chassis locations 14, 19, and 16.

078 N Y Error code $806B_{16}/153_8$ displayed? (General status 5153_8.)

079 1 Replace PC board at chassis location 19, check Bus Out/Tag Out cables, and check external device.

080 N Y Error code $806C_{16}/154_8$ displayed? (General status 5154_8.)

081 1 Replace PC board at chassis location 16, check Bus Out/Tag Out cables, and check external device.

082 N Y Error code $806D_{16}/155_8$ displayed? (General status 5155_8.)

083 1 Replace PC board at chassis location 02, check Bus Out/Tag Out cables, and check external device.

084 N Y Error code $806E_{16}/156_8$ displayed? (General status 5156_8.)

085 1 Replace PC boards at chassis locations 18, 16, and 17; check Bus Out/Tag Out cables; and check external device.

086 N Y Error code $806F_{16}/157_8$ displayed? (General status 5157_8.)

087 1 This error code is not used.

088 N Y Error code 8070_{16} displayed? (General status 5160_8.)

089 1 Replace PC board at chassis locations 14 and 15.

6
A

A
5

090 N Y Error code $8071_{16}/161_8$ displayed? (General status 5161_8.)

091 1 Replace PC boards at chassis locations 17 and 19.

092 N Y Error code $8072_{16}/162_8$ displayed? (General status 5162_8.)

093 1 Replace PC boards at chassis locations 18 and 19.

094 N Y Error code $8073_{16}/163_8$ displayed? (General status 5163_8.)

095 1 Replace PC board at chassis location 10.

096 N Y Error code $8074_{16}/164_8$ displayed? (General status 5164_8.)

097 1 Replace PC board at chassis location 19.

098 N Y Error code $8075_{16}/165_8$ displayed? (General status 5165_8.)

099 1 Replace PC board at chassis location 19.

100 N Y Error code $8076_{16}/166_8$ displayed? (General status 5166_8.)

101 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

102 N Y Error code $8077_{16}/167_8$ displayed? (General status 5167_8.)

103 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

104 N Y Error code $8078_{16}/170_8$ displayed? (General status 5170_8.)

105 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

106 N Y Error code $8079_{16}/171_8$ displayed? (General status 5171_8.)

107 1 Check seating/condition of Bus Out and Tag Out cables.

108 N Y Error code $807A_{16}/172_8$ displayed? (General status 5172_8.)

109 1 Replace PC boards at chassis locations 14, 19, and 16.

110 N Y Error code $807B_{16}/173_8$ displayed? (General status 5173_8.)

111 1 Replace PC board at chassis location 19, check Bus Out/Tag Out cables, and check external device.

112 N Y Error code $807C_{16}/174_8$ displayed? (General status 5174_8.)

7 7
A B

A B
6 6

113 1 Replace PC board at chassis location 16, check Bus Out/Tag Out cables, and check external device.

114 N Y Error code $807D_{16}/175_8$ displayed? (General status 5175_8.)

115 1 Replace PC board at chassis location 02, check Bus Out/Tag Out cables, and check external device.

116 N Y Error code $807E_{16}/176_8$ displayed? (General status 5176_8.)

117 1 Replace PC boards at chassis locations 18, 16, and 17; check Bus Out/Tag Out cables; and check external device.

118 N Y Error code $807F_{16}/177_8$ displayed? (General status 5177_8.)

119 1 This error code is not used.

120 N Y Error code $8080_{16}/200_8$ displayed? (General status 5200_8.)

121 1 Replace PC boards at chassis locations 14, 16, and 17.

122 N Y Error code $8081_{16}/201_8$ displayed? (General status 5201_8.)

123 1 Replace PC boards at chassis locations 17 and 19.

124 N Y Error code $8082_{16}/202_8$ displayed? (General status 5202_8.)

125 1 Replace PC boards at chassis locations 18 and 19.

126 N Y Error code $8083_{16}/203_8$ displayed? (General status 5203_8.)

127 1 Replace PC board at chassis location 10.

128 N Y Error code $8084_{16}/204_8$ displayed? (General status 5204_8.)

129 1 Replace PC board at chassis location 19.

130 N Y Error code $8085_{16}/205_8$ displayed? (General status 5205_8.)

131 1 Replace PC board at chassis location 19.

132 N Y Error code $8086_{16}/206_8$ displayed? (General status 5206_8.)

133 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

134 N Y Error code $8087_{16}/207_8$ displayed? (General status 5207_8.)

135 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

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7

136 N Y Error code $8088_{16}/210_8$ displayed? (General status 5210_8.)

137 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

138 N Y Error code $8089_{16}/211_8$ displayed? (General status 5211_8.)

139 1 Check seating/condition of Bus Out and Tag Out cables.

140 N Y Error code $808A_{16}/212_8$ displayed? (General status 5212_8.)

141 1 Replace PC boards at chassis locations 14, 19, and 16.

142 N Y Error code $808B_{16}/213_8$ displayed? (General status 5213_8.)

143 1 Replace PC board at chassis location 19, check Bus Out/Tag Out cables, and check external device.

144 N Y Error code $808C_{16}/214_8$ displayed? (General status 5214_8.)

145 1 Replace PC board at chassis location 16, check Bus Out/Tag Out cables, and check external device.

146 N Y Error code $808D_{16}/215_8$ displayed? (General status 5215_8.)

147 1 Replace PC board at chassis location 02, check Bus Out/Tag Out cables, and check external device.

148 N Y Error code $808E_{16}/216_8$ displayed? (General status 5216_8.)

149 1 Replace PC boards at chassis locations 18, 16, and 17; check Bus Out/Tag Out cables; and check external device.

150 N Y Error code $808F_{16}/217_8$ displayed? (General status 5217_8.)

151 1 This error code is not used.

152 N Y Error code $8090_{16}/220_8$ displayed? (General status 5220_8.)

153 1 Replace PC boards at chassis locations 19 and 17.

154 N Y Error code $8091_{16}/221_8$ displayed? (General status 5221_8.)

155 1 Replace PC boards at chassis locations 13, 17, and 19.

156 N Y Error code $8092_{16}/222_8$ displayed? (General status 5222_8.)

157 1 Replace PC boards at chassis locations 18 and 19.

158 N Y Error code $8093_{16}/223_8$ displayed? (General status 5223_8.)

9 9
A B

A B
8 8

159 1 Replace PC board at chassis location 10.

160 N Y Error code $8094_{16}/224_8$ displayed? (General status 5224_8.)

161 1 Replace PC board at chassis location 19.

162 N Y Error code $8095_{16}/225_8$ displayed? (General status 5225_8.)

163 1 Replace PC board at chassis location 19.

164 N Y Error code $8096_{16}/226_8$ displayed? (General status 5226_8.)

165 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

166 N Y Error code $8097_{16}/227_8$ displayed? (General status 5227_8.)

167 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

168 N Y Error code $8098_{16}/230_8$ displayed? (General status 5230_8.)

169 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

170 N Y Error code $8099_{16}/231_8$ displayed? (General status 5231_8.)

171 1 Check seating/condition of Bus Out and Tag Out cables.

172 N Y Error code $809A_{16}/232_8$ displayed? (General status 5232_8.)

173 1 Replace PC boards at chassis locations 14, 19, and 16.

174 N Y Error code $809B_{16}/233_8$ displayed? (General status 5233_8.)

175 1 Replace PC board at chassis location 19, check Bus Out/Tag Out cables, and check external device.

176 N Y Error code $809C_{16}/234_8$ displayed? (General status 5234_8.)

177 1 Replace PC board at chassis location 16, check Bus Out/Tag Out cables, and check external device.

178 N Y Error code $809D_{16}/235_8$ displayed? (General status 5235_8.)

179 1 Replace PC board at chassis location 02, check Bus Out/Tag Out cables, and check external device.

1
0
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A
9

180 N Y Error code $809E_{16}/236_8$ displayed? (General status 5236_8.)

181 1 Replace PC boards at chassis locations 18, 16, and 17; check Bus Out/Tag Out cables; and check external device.

182 N Y Error code $809F_{16}/237_8$ displayed? (General status 5237_8.)

183 1 This error code is not used.

184 N Y Error code $80A0_{16}/240_8$ displayed? (General status 5240_8.)

185 1 Replace PC boards at chassis locations 14 and 17.

186 N Y Error code $80A8_{16}/250_8$ displayed? (General status 5250_8.)

187 1 Replace PC boards at chassis locations 14 and 17.

188 N Y Error code $80A9_{16}/251_8$ displayed? (General status 5251_8.)

189 1 Replace PC board at chassis location 14.

190 N Y Error code $80AA_{16}/252_8$ displayed? (General status 5252_8.)

191 1 Replace PC boards at chassis locations 19 and 17.

192 N Y Error code $80AB_{16}/253_8$ displayed? (General status 5253_8.)

193 1 Replace PC boards at chassis locations 14 and 17.

194 N Y Error code $80AC_{16}/254_8$ displayed? (General status 5254_8.)

195 1 Replace PC board at chassis location 16.

196 N Y Error code $80AD_{16}/255_8$ displayed? (General status 5255_8.)

197 1 Replace PC boards at chassis locations 19 and 16.

198 N Y Error code $80B1_{16}/261_8$ displayed? (General status 5261_8.)

199 1 Replace PC boards at chassis locations 17 and 19.

200 N Y Error code $80B2_{16}/262_8$ displayed? (General status 5262_8.)

201 1 Replace PC boards at chassis locations 18 and 19.

202 N Y Error code $80B3_{16}/263_8$ displayed? (General status 5263_8.)

203 1 Replace PC board at chassis location 10.

204 N Y Error code $80B4_{16}/264_8$ displayed? (General status 5264_8.)

1 1
1 1
A B

A B
1 1
0 0

205 1 Replace PC board at chassis location 19.

206 N Y Error code $80B5_{16}/265_8$ displayed? (General status 5265_8.)

207 1 Replace PC board at chassis location 19.

208 N Y Error code $80B6_{16}/266_8$ displayed? (General status 5266_8.)

209 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

210 N Y Error code $80B7_{16}/267_8$ displayed? (General status 5267_8.)

211 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

212 N Y Error code $80B8_{16}/270_8$ displayed? (General status 5270_8.)

213 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

214 N Y Error code $80B9_{16}/271_8$ displayed? (General status 5271_8.)

215 1 Check seating/condition of Bus Out and Tag Out cables.

216 N Y Error code $80BA_{16}/272_8$ displayed? (General status 5272_8.)

217 1 Replace PC boards at chassis locations 14, 19, and 16.

218 N Y Error code $80BB_{16}/273_8$ displayed? (General status 5273_8.)

219 1 Replace PC board at chassis location 19, check Bus Out/Tag Out cables, and check external device.

220 N Y Error code $80BC_{16}/274_8$ displayed? (General status 5274_8.)

221 1 Replace PC board at chassis location 16, check Bus Out/Tag Out cables, and check external device.

222 N Y Error code $80BD_{16}/275_8$ displayed? (General status 5275_8.)

223 1 Replace PC board at chassis location 02, check Bus Out/Tag Out cables, and check external device.

224 N Y Error code $80BE_{16}/276_8$ displayed? (General status 5276_8.)

225 1 Replace PC boards at chassis locations 18, 16, and 17; check Bus Out/Tag Out cables; and check external device.

1
2
A

A
1
1

226 N Y Error code $80BF_{16}/277_8$ displayed? (General status 5277_8.)

227 1 This error code is not used.

228 N Y Error code $80C0_{16}/300_8$ displayed? (General status 5300_8.)

229 1 Replace PC board at chassis location 16.

230 N Y Error code $80C1_{16}/301_8$ displayed? (General status 5301_8.)

231 1 Replace PC boards at chassis locations 17 and 19.

232 N Y Error code $80C2_{16}/302_8$ displayed? (General status 5302_8.)

233 1 Replace PC boards at chassis locations 18 and 19.

234 N Y Error code $80C3_{16}/303_8$ displayed? (General status 5303_8.)

235 1 Replace PC board at chassis location 10.

236 N Y Error code $80C4_{16}/304_8$ displayed? (General status 5304_8.)

237 1 Replace PC board at chassis location 19.

238 N Y Error code $80C5_{16}/305_8$ displayed? (General status 5305_8.)

239 1 Replace PC board at chassis location 19.

240 N Y Error code $80C6_{16}/306_8$ displayed? (General status 5306_8.)

241 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

242 N Y Error code $80C7_{16}/307_8$ displayed? (General status 5307_8.)

243 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

244 N Y Error code $80C8_{16}/310_8$ displayed? (General status 5310_8.)

245 1 Replace PC boards at chassis locations 17, 18, and 19. (Drivers to external device have a grounded signal.)

246 N Y Error code $80C9_{16}/311_8$ displayed? (General status 5311_8.)

247 1 Check seating/condition of Bus Out and Tag Out cables.

248 2 Replace PC boards at chassis locations 18 and 19.

249 N Y Error code $80CA_{16}/312_8$ displayed? (General status 5312_8.)

1 1
3 3
A B

A B
1 1
2 2

250 | 1 Replace PC boards at chassis locations 14, 19, and 16.

251 N Y Error code 80CB$_{16}$/313$_8$ displayed? (General status 5313$_8$.)

252 | 1 Replace PC board at chassis location 19, check Bus Out/Tag Out cables, and check external device.

253 N Y Error code 80CC$_{16}$/314$_8$ displayed? (General status 5314$_8$.)

254 | 1 Replace PC board at chassis location 16, check Bus Out/Tag Out cables, and check external device.

255 N Y Error code 80CD$_{16}$/315$_8$ displayed? (General status 5315$_8$.)

256 | 1 Replace PC board at chassis location 02, check Bus Out/Tag Out cables, and check external device.

257 N Y Error code 80CE$_{16}$/316$_8$ displayed? (General status 5316$_8$.)

258 | 1 Replace PC boards at chassis locations 18, 16, and 17; check Bus Out/Tag Out cables; and check external device.

259 N Y Error code 80CF$_{16}$/317$_8$ displayed? (General status 5317$_8$.)

260 | 1 This error code is not used.

261 N Y Error code 80D8$_{16}$/330$_8$ displayed? (General status 5330$_8$.)

262 | 1 Replace PC boards at chassis locations 19 and 16.

263 N Y Code 8101$_{16}$/401$_8$ displayed? (General status 5401$_8$.)

264 | 1 Retry autoloading. If error persists, try different source data. Replace PC boards at chassis locations 01, 02, and 05. Check PP I/O channel cables.

265 N Y Code 8102$_{16}$/402$_8$ displayed? (General status 5402$_8$.)

266 | 1 Retry autoloading. If error persists, try different source data. Replace PC boards at chassis locations 01, 02, and 05. Check PP I/O channel cables.

267 N Y Code 8103$_{16}$/403$_8$ displayed? (General status 5403$_8$.)

268 | 1 Retry autoloading. If error persists, try different source data. Replace PC boards at chassis locations 01, 02, and 05. Check PP I/O channel cables.

269 N Y Code 8140$_{16}$/404$_8$ displayed? (General status 5404$_8$.)

1 1
4 4
A B

A A
1 1
3 3

270 1 Replace PC board at chassis location 10.

271 N Y Code $8141_{16}/501_8$ displayed? (General status 5501_8.)

272 1 Retry autoloading. If error persists, try different source data and/or load device. Replace PC boards at chassis locations 17, 18, and 19. Check FIPS I/O device cables. Check external device.

273 N Y Code $8142_{16}/502_8$ displayed? (General status 5502_8.)

274 1 Retry autoloading. If error persists, try different source data and/or load device. Replace PC boards at chassis locations 17, 18, and 19. Check FIPS I/O device cables. Check external device.

275 N Y Code $8143_{16}/503_8$ displayed? (General status 5503_8.)

276 1 Retry autoloading. If error persists, try different source data and/or load device. Replace PC boards at chassis locations 17, 18, and 19. Check FIPS I/O device cables. Check external device.

277 N Y Code $8144_{16}/504_8$ displayed? (General status 5504_8.)

278 1 Retry autoloading. If error persists, try different source data and/or load device. Replace PC boards at chassis locations 17, 18, and 19. Check FIPS I/O device cables. Check external device.

279 N Y Code $8145_{16}/505_8$ displayed? (General status 5505_8.)

280 1 Retry autoloading. If error persists, try different source data and/or load device. Replace PC boards at chassis locations 17, 18, and 19. Check FIPS I/O device cables. Check external device.

281 N Y Code $8147_{16}/507_8$ displayed? (General status 5507_8.)

282 1 Replace PC boards at chassis locations 17, 18, and 19. Check FIPS I/O device cables. Check external device.

283 N Y Code $8148_{16}/510_8$ displayed? (General status 5510_8.)

284 1 Replace PC boards at chassis locations 17, 18, and 19. Check FIPS I/O device cables. Check external device.

285 N Y Code $820X_{16}/60X_8$ displayed? (General status $560X_8$.)

1 Retry autoloading. If error persists, try different source data and/or load device. Replace PC boards at chassis locations 17, 18 and 19. Check FIPS I/O device cables. Check external device.

1
5
A

A
1
4

286 N Y Code $8800_{16}/000_8$ displayed? (General status 0000_8.)

287 1 This code indicates normal completion of the internal diagnostics when no LED indicators on the PC boards are lit. Note that various malfunctions can prevent the display of error codes such that an 8800_{16} may be displayed even though an error exists. Therefore, examine LEDs on PC boards for possible errors and troubleshoot as follows:

Board 05 LED 1 (upper) remains lit - Replace board at locations 01 and 05.
LED 2 remains lit - Replace board at locations 02, 04, 08, and 09.
LED 3 remains lit - Replace board at locations 02, 04, and 05.
LED 4 remains lit - Replace board at locations 01 and 05.
LED 5 remains lit - Replace board at locations 08 and 09.
LED 6 remains lit - Replace board at locations 02, 04, and 05.

Board 13 LED remains lit - Replace board at locations 08, 09, and 13.

Board 17 or 18 LED 1 (upper) remains lit - Replace board at locations 14, 15, 16, 17, 18, and 19.

LED 2 (lower) remains lit - Replace board at locations 17 and 18.

Board A21 LED 1 (upper) remains lit - Replace board at location 21.

LED 2 (middle) remains lit - Indicates that the FV720 was the last coupler to write to the maintenance panel.

LED 3 (lower) remains lit - Indicates that the FR205 was the last coupler to write to the maintenance panel.

Note - If all LEDs are unlit on board A21, replace boards at locations A21, 14, and 15.

288 N Y Code $8810_{16}/000_8$ displayed? (General status 0000_8.)

289 1 This code indicates that an autoload from the PP has started.

290 N Y Code $8820_{16}/000_8$ displayed? (General status 0000_8.)

291 1 This code indicates that an autoload from an attached disk device has started.

N Y Code $8840_{16}/000_8$ displayed? (General status 0000.)

1 This code indicates that the ROM resident portion of the autoload routine has successfully completed.

292 N Y Code $8888_{16}/000_8$ displayed? (General status 0000_8.)

293 1 This code indicates that the autoload routine has successfully completed.

294 1 For any other error code being displayed, examine LEDs on PC board for possible errors. Refer to information following SAM step 285 for LED troubleshooting information. If unable to isolate problem, call Technical Support for assistance.

******

SAM 4 - CLM LOADER/MONITOR ERRORS

This SAM is for isolating errors reported by the CLM loader and monitor program of the PP down-line diagnostics. Refer to section 6 for CLM loader/monitor description and refer to procedure 24 for logic card replacement information.

001 N Y Is there a CLM00 - PARAMETER ERROR message?

002 1 Verify parameters entered for test being run.

003 N Y Is there a CLM01 - PAUSE IN-LINE FAILED message?

004 1 Replace PC board at location 01. (PC board at location 01 might require tuning; refer to Clock Tuning Procedure in section 3 for procedure.)

005 N Y Is there a PROCESSOR ERROR ON MASTER CLEAR message? (Note that CE may continue test execution with this error for additional isolation if desired. However, some tests may not execute correctly.)

006 1 Replace RAM PC board at chassis location 10 of coupler.

007 2 Execute internal diagnostics per SAM 3 if problem persists.

008 N Y Is there a TTTMM STOPPED ON ERROR message? (TTTMM is the name of test/module that stopped.)

009 1 Replace PC boards in the following order: Chassis locations 10, 01, and 05. (PC board at location 01 might require tuning; refer to section 3 for procedure.)

010 N Y Is there an E0002 - CHANNEL PARITY ERROR message?

011 1 Replace PC board at location 01. (PC board at location 01 might require tuning; refer to Clock Tuning Procedure in section 3 for procedure.)

012 2 Check CYBER channel I/O cables.

013 N Y Is there an E0003 - TEST LOADED INCORRECTLY message?

014 1 Replace PC boards in the following order: Chassis locations 10, 01, 08, and 09. (PC board at location 01 might require tuning; refer to Clock Tuning Procedure in section 3 for procedure.)

015 N Y Is there an E0004 - TEST NOT IN SYSTEM FILE message?

016 1 Attach test to be run by entering K.SCRATCH=XXX. (XXX = CCM, NDM, or NDP.)

017 N Y Is there a CLEAR RM TO TERMINATE TEST message?

2 2
A B

```
    A B
    1 1
    | |
    | |
018 | 1  Indicates that the repeat module switch must be turned off before the test is
    |    terminated.  If left on, the loader/monitor module keeps repeating.
    |
019 N Y  Is there a CLM01 - CH. ACTIVE AND EMPTY ON INPUT message?
    | |
020 | 1  Replace PC boards at locations 01 and 05.  (PC board at location 01 might require
    |    tuning; refer to Clock Tuning Procedure section 3 for procedure.)
    |
021 N Y  Is there a CLM01 - NO INACTIVE ON EQUIP FUNC message?
    | |
022 | 1  Check CYBER I/O channel assignment being used.
    | |
    | 2  Verify that no indicators remain lit on PC boards at chassis locations 05, 13,
    | |  and 18.  (A lit indicator indicates that the internal diagnostics have detected an
    | |  error.  Go to SAM 3 to isolate the error.)
    | |
    | 3  Replace PC board at chassis location 01.  (PC board at location 01 might require
    |    tuning; refer to Clock Tuning Procedure in section 3 for procedure.)
    |
023 N Y  Is there a CLM02 - HALT - STOPPED ON ERROR message?
    | |
024 | 1  Replace PC board at chassis location 10.
    |
025 1    For any other CLM errors/problems, try running the internal diagnostics per SAM 3
         for additional isolation.  If problem persists, contact Technical Support for
         assistance.
```

*****

SAM 5 - CCM DOWN-LINE DIAGNOSTIC ERRORS

This SAM is for isolating errors detected by the CCM memory test of the PP down-line diagnostics. Refer to section 6 for CCM test description and refer to procedure 24 for logic card replacement information.

```
001  N Y  Is there a CCM00 - SUSPECTED PARAMETER ERROR message?
     | |
002  | 1  Verify parameter entry in P1.  (P1 must be either 0 or 1 to specify 16K RAM.)
     |
003  N Y  Is there a CCM01 - CONTROLWARE NOT RUNNING message?
     | |
004  | 1  Replace PC board at location 01.  (PC board at location 01 might require tuning;
     |    refer to Clock Tuning Procedure in section 3 for procedure.)
     |
005  N Y  Is there a CCM01 - ----- COMPARE ----- message?
     | |
006  | 1  Replace PC board at location 01.  (PC board at location 01 might require tuning;
     |    refer to Clock Tuning Procedure in section 3 for procedure.)
     |
007  N Y  Is there a CCM0x - ABORTED ON FUNCTION message?  (Note that first function executed
     | |  is an 0740 that tries to master clear the coupler.)
     | |
008  | 1  Check that CYBER channel I/O cables are present and properly seated.
     | |
009  | 2  Replace PC boards in the following order:  Chassis locations 01, 02, 04, and 13.
     |    (PC board at location 01 might require tuning; refer to Clock Tuning Procedure
     |    in section 3 for procedure.)
     |
010  N Y  Is there a CCM01 - ABORTED ON DISCONNECT COMMAND message?
     | |
011  | 1  Replace PC board at location 05.
     |
012  N Y  Is there a CCM05 - ABORTED ON EMPTY PARITY ERROR message?
     | |
013  | 1  Replace PC board at location 02.
     |
014  N Y  Is there a CCM0x - ABORTED ON MEM PAR ERROR message?
     | |
015  | 1  Replace PC board at location 10.
     | |
016  | 2  Check for low +5 V.
     |
017  N Y  Is there a CCM0x - ABORTED ON COMPARE COMMAND message?
     | |
018  | 1  Replace PC boards in the following order:  Chassis locations 10 and 01.  (PC board
     |    at location 01 might require tuning; refer to Clock Tuning Procedure in section 3
     |    for procedure.)
     |
     2
     A
     A
     1
     |
     |
019  N Y  Is there a CCM00 - RM SELECTED, PPU STATUS = PAUSE message?
     | |
020  | 1  Change parameter entry to turn off repeat module selection.
     |    -
021  N Y  Is there a CCM0x - MODULE WILL NOT RUN WITH AL LESS THAM 10B message?
     | |
022  | 1  Set access level parameter to less than 10 binary.
     |    -
023  1    For any other CCM test errors/problems, try replacing PC boards at locations 10,
     -    08, and 09.  If problem persists, try to isolate cause by running internal
          diagnostics per SAM 3, then contact Technical Support for assistance as needed.
```

*****

SAM 6 - NDM DOWN-LINE DIAGNOSTIC ERRORS

This SAM is for isolating errors detected by the NDM memory test of the PP down-line diagnostics. Refer to section 6 for NDM test description and refer to procedure 24 for logic card replacement information.

```
001  N Y  Is there an NDM - PARAMETER ERROR DETECTED message?
     | |
002  | 1  Verify parameter entries and rerun test.
     |
003  1    For any other type of error message reported by NDM, try replacing PC boards at
          locations 10, 08, and 09. If problem persists, try to isolate cause by running
          internal diagnostics per SAM 3, then contact Technical Support for assistance as
          needed.
```

*****

SAM 7 - NDP DOWN-LINE DIAGNOSTIC ERRORS

This SAM is for isolating errors detected by the NDP processor test of the PP down-line diagnostics. Refer to section 6 for NDP test description and refer to procedure 24 for logic card replacement information.

```
001  N Y  Is there an NDP - PARAMETER ERROR DETECTED message?
     | |
002  | 1  Verify parameter entries and rerun test.
     |
003  1    For any other type of error message reported by NDP, try replacing PC boards at
          locations 08 and 09. If problem persists, try to isolate cause by running
          internal diagnostics per SAM 3, then contact Technical Support for assistance as
          needed.
```

*****

REMOVE/REPLACE/ADJUSTMENT PROCEDURES

SECTION 6B

PROCEDURE 1. POWER APPLICATION/REMOVAL

Refer to figure 6B-1 for the location of switches and indicators used in this procedure.

To apply power to the coupler:

1. Open front cabinet door and turn 50/60-HZ POWER DISCONNECT switch ON.
2. Turn 400-HZ POWER DISCONNECT circuit breaker/switch ON. POWER ON indicator lights. If indicator fails to light, verify that site power is available and/or replace lamp (procedure 7).

NOTE

When 400-HZ POWER DISCONNECT circuit breaker is left ON while 50/60-HZ POWER DISCONNECT switch is OFF, a thermal switch drops 400-Hz input to power supplies after approximately 90 seconds. AIRFLOW SENSOR RELAY INDICATOR lights to indicate this condition.

To remove power from the coupler:

1. Turn 400-HZ POWER DISCONNECT circuit breaker/switch OFF.
2. Turn 50/60-HZ POWER DISCONNECT switch OFF.

To apply power to the attached subsystem devices:

1. Open front cabinet door and turn POWER ON UNIT A and/or UNIT B switches to ON position as applicable.

To remove power from the attached subsystem devices:

1. Turn POWER ON UNIT A and/or UNIT B switches to OFF position as applicable.

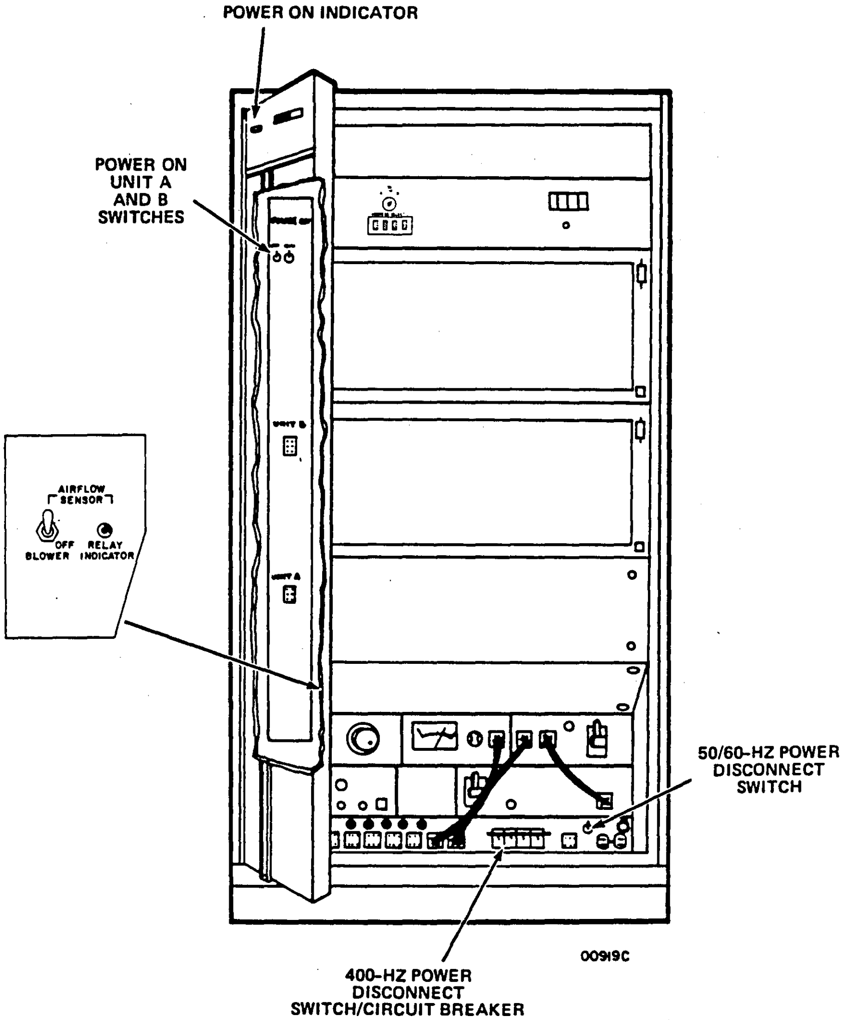
POWER ON INDICATOR
POWER ON UNIT A AND B SWITCHES
AIRFLOW SENSOR
OFF BLOWER
RELAY INDICATOR
50/60-HZ POWER DISCONNECT SWITCH
400-HZ POWER DISCONNECT SWITCH/CIRCUIT BREAKER
00919C

Figure 6B-1. Location of Input Power Switches

PROCEDURE 2. VOLTAGE PERCENTAGE METER CALIBRATION

Perform the following steps to calibrate the voltage percentage meter of the coupler. Refer to figure 6B-2 for location of controls.

1. Apply power to coupler (procedure 1).
2. Connect digital dc voltmeter between +5 V bus bar and ground. +5 V bus bar is located at left side of cabinet as viewed from rear. Position voltmeter so it can be seen from front of coupler.
3. Turn +5 V ADJUST control until digital voltmeter shows +5.00 V ± 0.05 V.

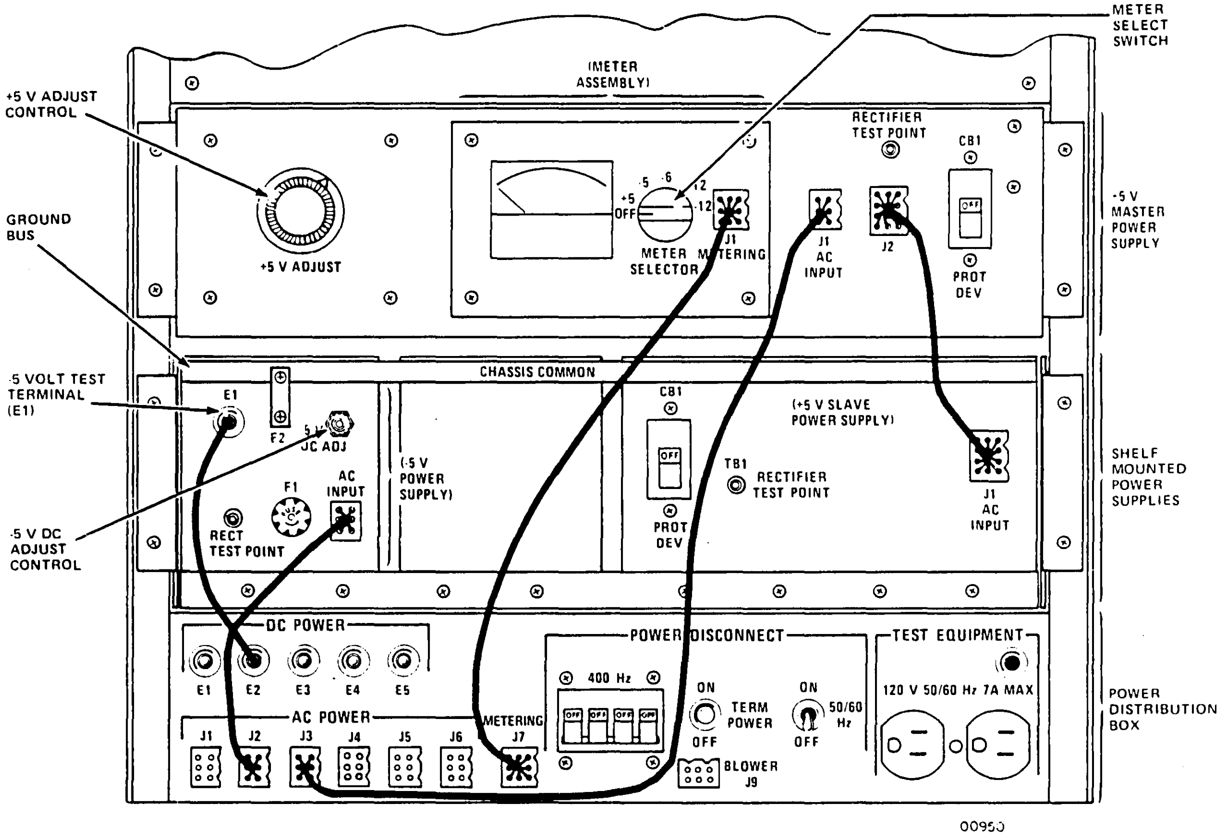

Figure 6B-2. Location of Voltage Adjustment Controls

4. Turn METER SELECTOR switch to +5 position. If meter shows 0 ±1 percent, meter is calibrated correctly for +5 V.

5. Connect digital dc voltmeter between -5 V terminal (E1) at front of -5 V supply and ground.

6. Adjust -5 V DC ADJ control until digital voltmeter shows -5.00 V ±0.05 V.

7. Turn METER SELECTOR switch to -5 position. If meter shows 0 ±1 percent, meter is calibrated correctly for +5 V. If either the +5 V or -5 V calibration is incorrect, go to step 8.

8. Refer to figure 6B-3 for assembly details and remove four screws mounting meter assembly to +5 V master power supply.

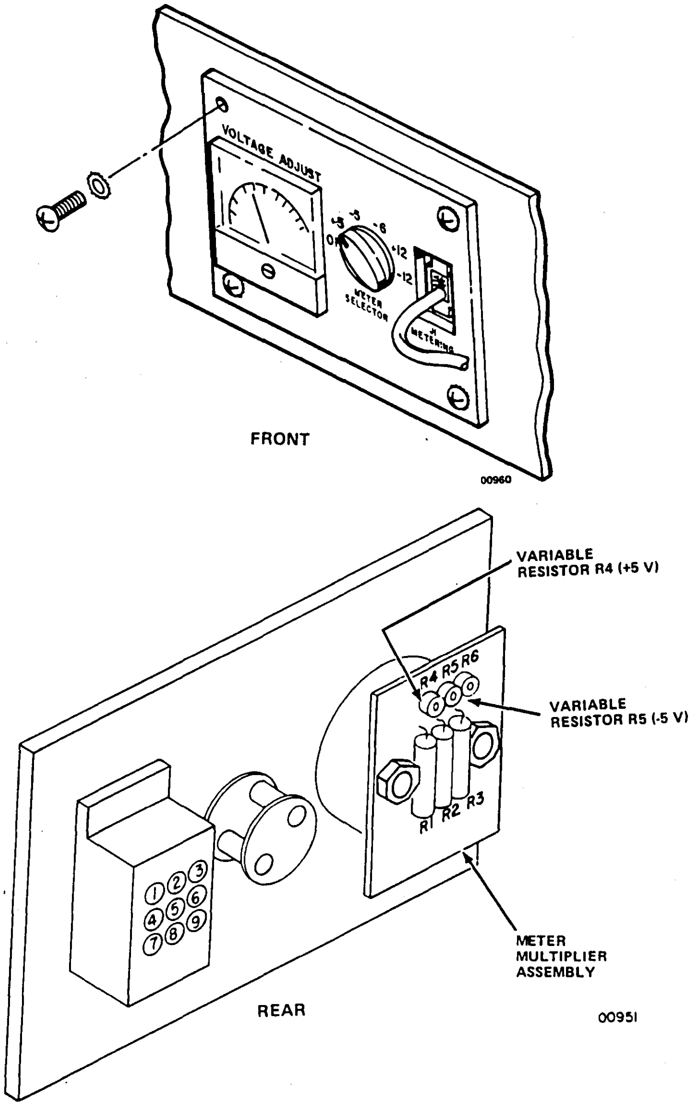

Figure 6B-3. Meter Assembly Details

9. Turn METER SELECTOR switch to +5 position. Adjust variable resistor R4 until meter shows 0 percent.

10. Turn METER SELECTOR switch to -5. Adjust variable resistor R4 until meter shows 0 percent.

11. If both +5 V and -5 V adjustments produce 0 percent meter readings, reinstall meter assembly in +5 V master power supply. Otherwise, replace meter assembly (procedure 8).

PROCEDURE 3. AIRFLOW SENSOR TEST

Refer to figure 6B-1 for input power control switch and indicator locations and perform the following steps to test the operation of the airflow sensor.

1. Turn coupler power off (procedure 1).
2. Turn 400-HZ POWER DISCONNECT circuit breaker/switch ON. POWER ON indicator lights.

NOTE

Leave 50/60-HZ POWER DISCONNECT switch in OFF position so that blower is not running during this test.

3. Wait approximately 90 seconds and check for the following:
   - If POWER ON indicator goes out and AIRFLOW SENSOR RELAY INDICATOR lights, test is successful. Turn 400-HZ POWER DISCONNECT circuit breaker/switch OFF and turn 50/60-HZ POWER DISCONNECT switch ON. Allow time for unit to cool and then turn 400-HZ POWER DISCONNECT circuit breaker/switch back ON.
   - If POWER ON indicator goes out but AIRFLOW SENSOR RELAY INDICATOR does not light, replace AIRFLOW SENSOR RELAY INDICATOR (procedure 9).
   - If POWER ON indicator does not go out, turn 400-HZ POWER DISCONNECT circuit breaker OFF and replace airflow sensor (procedure 10).

PROCEDURE 4. AIR FILTER CLEANING

To clean the cabinet input air filter, refer to figure 6B-4 and perform the following steps:

1. Turn coupler power off (procedure 1).
2. Open rear cabinet door and slide air filter out from its position at base of shroud.
3. Use vacuum cleaner to remove dirt and lint from filter, working from dirty side of filter. If filter still appears dirty after vacuuming, rinse filter in water, shake it, and allow it to dry.
4. Insert air filter in cabinet and close rear cabinet door.

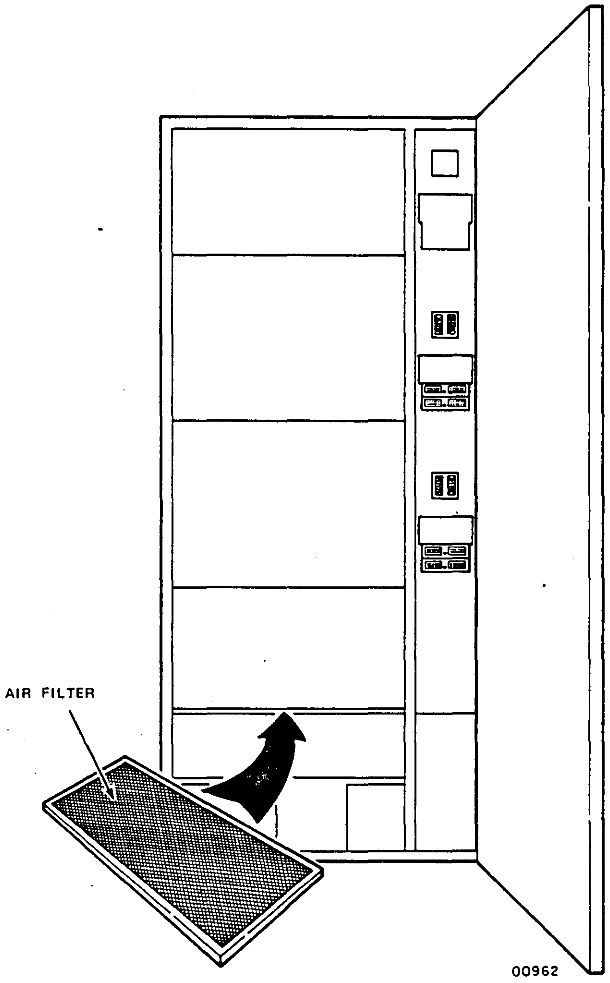

Figure 6B-4. Air Filter Location

PROCEDURE 5. 50/60-Hz POWER FAULT ISOLATION

Perform the following steps to isolate 50/60-Hz power faults.

WARNING

> Voltage tests in this procedure involve dangerous voltages. Do not touch exposed voltmeter leads, connector pins, or terminals.

1. Refer to figure 6B-5. With coupler power on (procedure 1), use ac voltmeter to test for 120 V between pins 1 and 2 of connector J9 at front of power distribution

box and then remove power from coupler (procedure 1). If 120 V is absent, go to step 3. Otherwise, refer to figure 6B-6 and remove front cover of blower assembly.

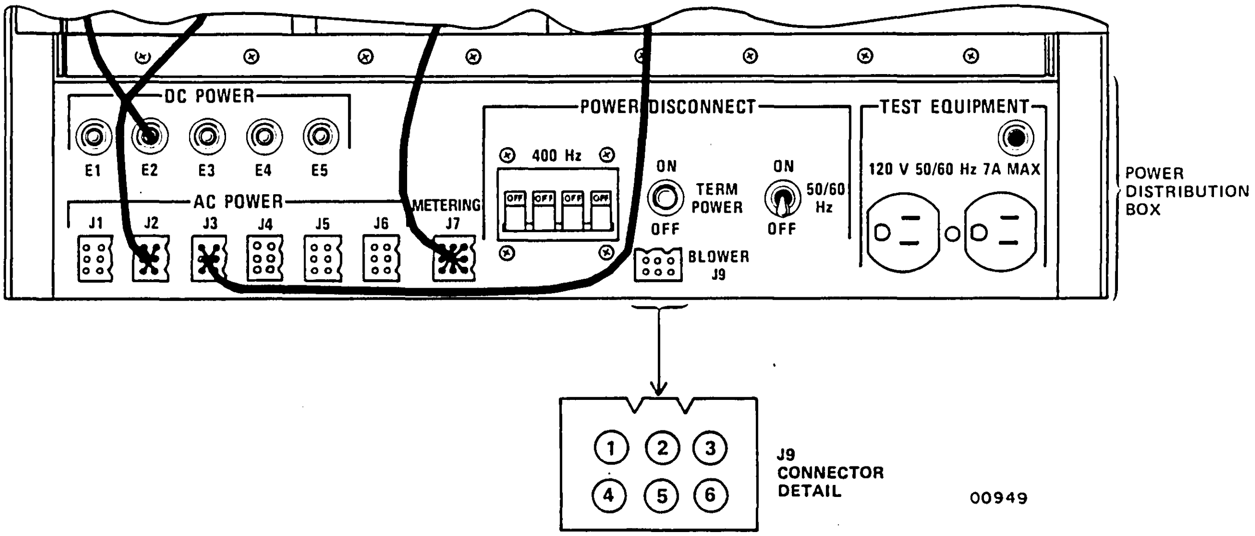

Figure 6B-5. Connector J9 Pin Detail

2. Use ohmmeter to test for continuity between terminals 2 and 3 of BLOWER switch (figure 6B-6) while switch is in its rest position. If continuity is present, replace blower (procedure 11). Otherwise, replace BLOWER switch (procedure 12).

3. Refer to figure 6B-7 and remove rear cover from power distribution box.

4. Turn 50/60-HZ POWER DISCONNECT switch ON and use ac voltmeter to test for 120 V between terminals 1 and 2 of electromagnetic interference (EMI) filter. If 120 V is present, replace EMI filter (procedure 13). If 120 V is absent and input power is 60 Hz, replace 50/60-HZ POWER DISCONNECT switch (procedure 14). Otherwise, go to step 5.

5. Use ac voltmeter to test for 220 - 250 V between transformer COM terminal and appropriate input voltage terminal on transformer. If 220 - 250 V is present, replace transformer (procedure 15). Otherwise, replace 50/60-HZ POWER DISCONNECT switch (procedure 14).

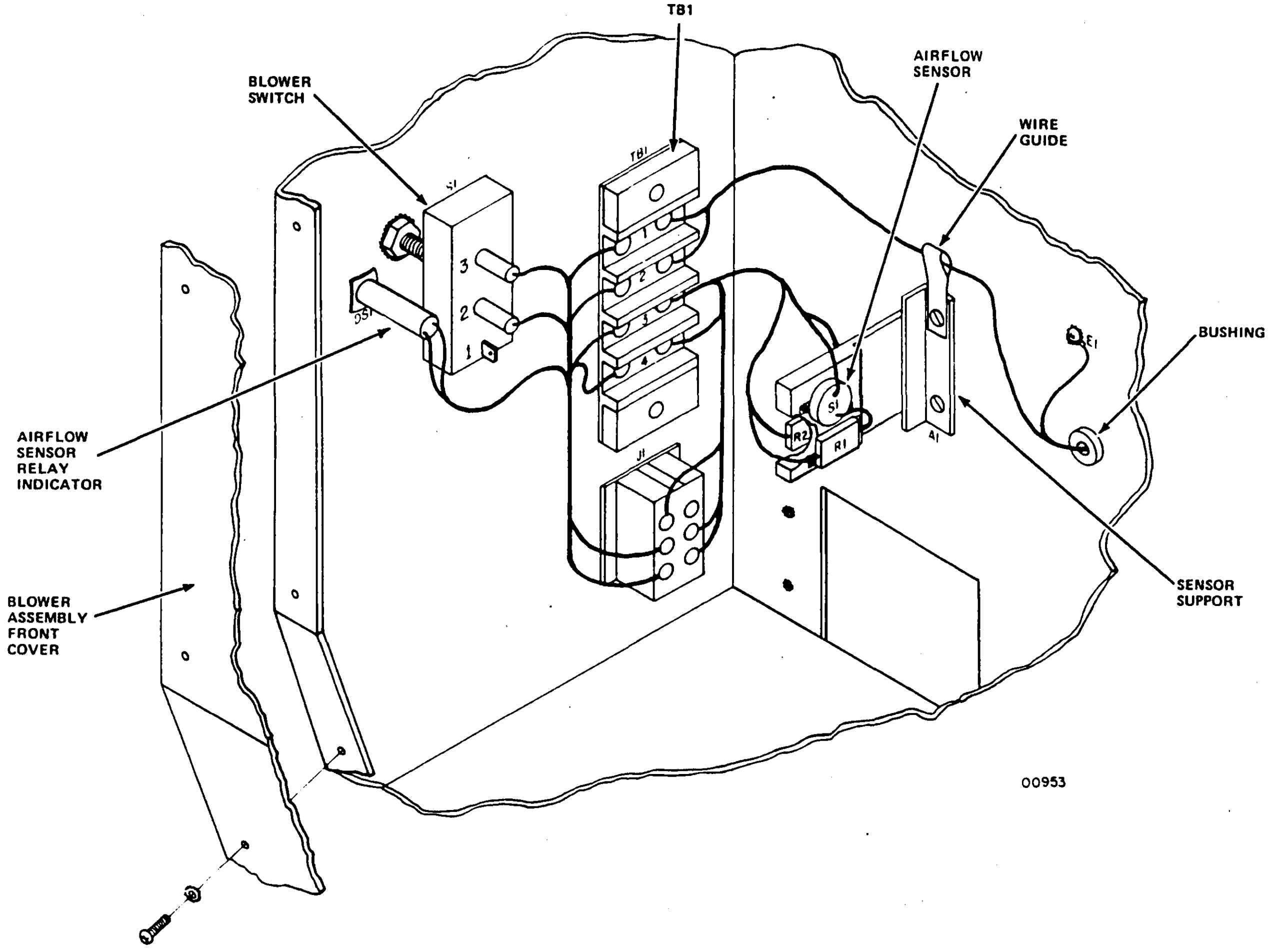

Figure 6B-6. Blower Assembly Components

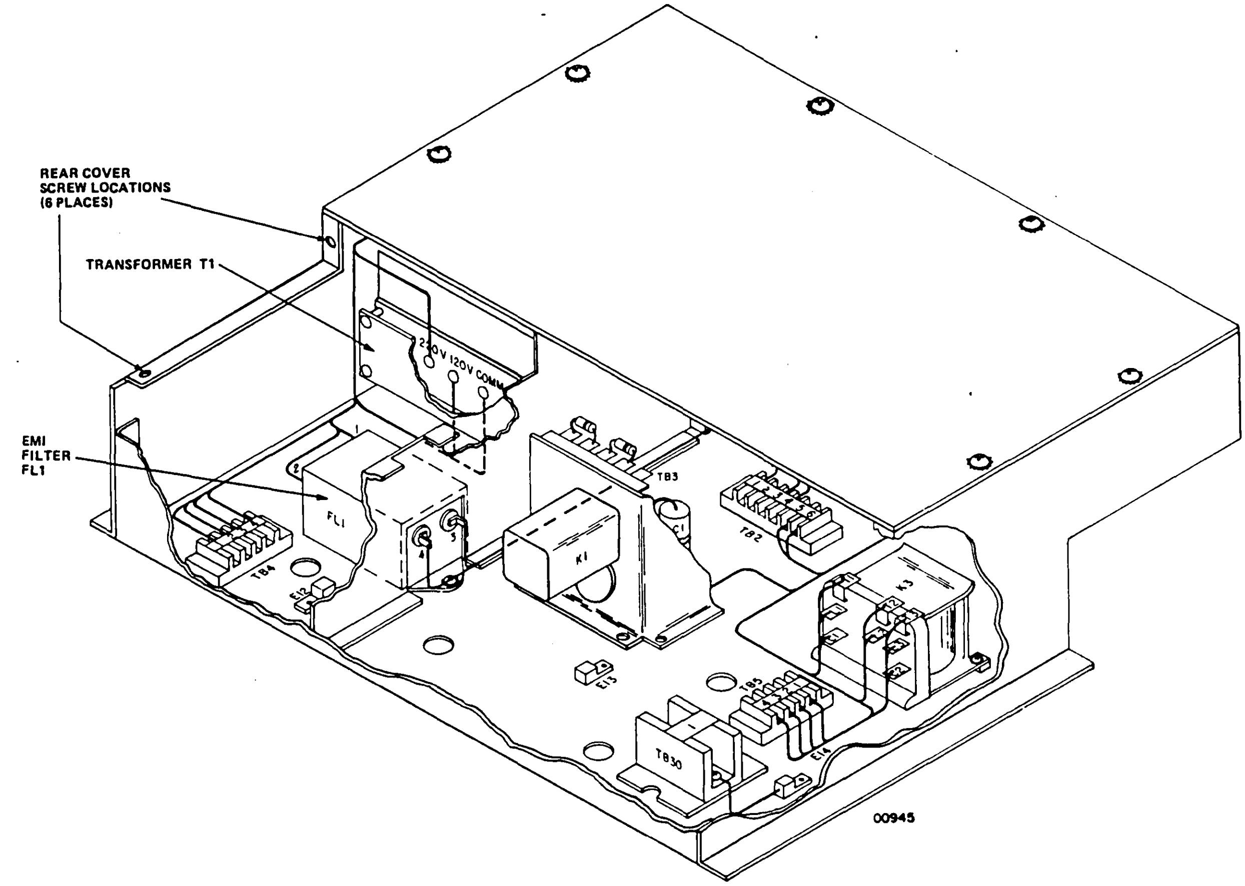

Figure 6B-7. Power Distribution Box 50/60-Hz Components

PROCEDURE 6. 400-HZ POWER FAULT ISOLATION

Perform the following steps to isolate 400-Hz power faults.

WARNING

> Voltage tests in this procedure involve dangerous voltages. Do not touch exposed voltmeter leads, connector pins, or terminals.

1. Turn coupler power on (procedure 1).
2. Refer to figure 6B-2 for location of controls and observe percentage meter while turning METER SELECTOR switch from -5 to +5 position. If meter pointer remains at left side of percentage scale for both voltages, go to step 6. Otherwise, go to step 3.
3. Turn METER SELECTOR switch to -5 position. If it is possible to adjust -5 V DC ADJ control to make meter show 0 percent, go to step 4. Otherwise replace -5 V power supply (procedure 16).
4. Turn METER SELECTOR switch to +5 position. If meter pointer is at or to left of -6 percent, go to step 5. Otherwise, adjust +5 V ADJUST and -5 V DC ADJ controls until meter shows 0 percent for each adjustment.

NOTE

> At 0 percent meter reading, total +5 V power requirement is within a few percent of 100-A. Therefore, in some cases, coupler is able to run even when master or slave +5 V, 100 A power supply is out of circuit. However, total failure of either +5 V supply causes +5 V voltage to drop approximately 7 percent, resulting in coupler transmitter disable. In this case, adjusting +5 V ADJUST control to make meter show 0 percent may cause circuit breaker to trip on the operating +5 V power supply.

5. Turn METER SELECTOR switch to +5 and observe meter while momentarily unplugging power cable from connector J2 on +5 V master power supply. If meter reading drops abruptly, replace +5 V slave power supply (procedure 16). Otherwise, replace +5 V master power supply (procedure 16).
6. Refer to figure 6B-8 and use ac voltmeter to test for 208 V between following pins of any two unused connectors numbered between J1 and J6 on power distribution box.

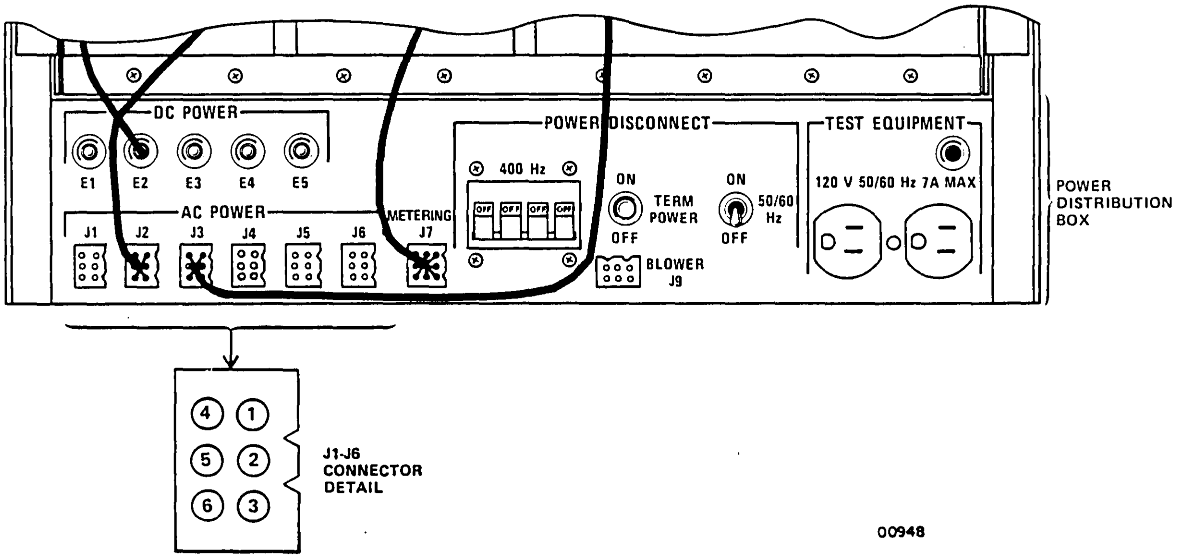

Figure 6B-8. Connector Pin Locations

Phase	First Connector Pin	Second Connector Pin
L1/L2	2	3
L1/L3	2	4
L2/L3	3	4

If 208 V is present for all phases, request additional help from technical support group to isolate problem. Otherwise, remove power from coupler (procedure 1) and go to step 7.

7. Refer to figure 6B-9 and remove rear cover from power distribution box.

8. Apply power to coupler (procedure 1). If test in step 6 showed 208 V present for only one or two phases, use ac voltmeter to test for 208 V between the following terminals of 400-Hz power relay:

   L1 and L2
   L1 and L3
   L2 and L3

   If 208 V is present for all phases, replace 400-Hz power relay (procedure 17). Otherwise, replace 400-Hz circuit breaker (procedure 18).

9. Use ac voltmeter to test for 120 V between terminals C1 and C2 of 400-Hz power relay. If 120 V is present, replace 400-Hz power relay (procedure 17). Otherwise, replace 400-Hz control relay (procedure 19). If this does not remedy problem, remove power from coupler (procedure 1), reinstall old 400-Hz control relay, and go to step 10.

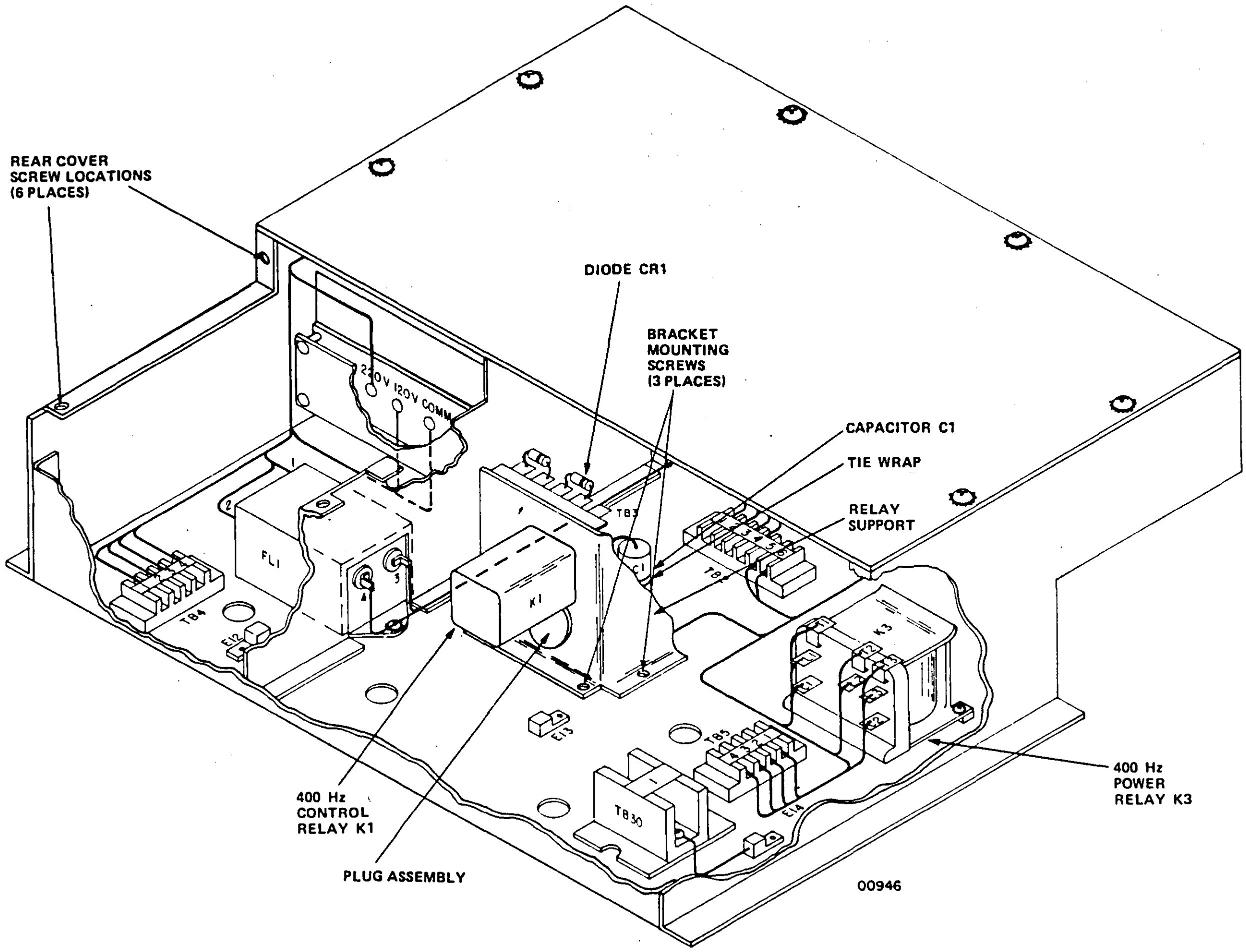

Figure 6B-9. Power Distribution Box 400-Hz Components

10. Refer to figure 6B-6. Remove front cover from blower assembly, and use ohmmeter to check for continuity across both terminals of thermal sensor S1. If open, replace S1 (procedure 10). If continuity exists, go to step 11.

11. Refer to figure 6B-9 and remove screws holding relay support. Carefully rotate relay support to provide access to diode CR1 and capacitor C1.

12. Use ohmmeter placed on low resistance range to test resistance across diode CR1. Switch ohmmeter leads, and again test resistance across diode. One test should indicate high resistance and the other test should indicate low resistance. If both tests indicate high resistance or if both tests indicate low resistance, replace diode CR1 (procedure 20). Otherwise, replace capacitor C1 (procedure 21).

PROCEDURE 7. POWER-ON INDICATOR LAMP REPLACEMENT

Perform the following steps to replace the POWER ON indicator lamp:

1. Remove power from coupler (procedure 1).
2. Refer to figure 6B-10. Squeeze top and bottom of POWER ON lens and pull to release.
3. Remove burned out lamp using long-nose pliers or tweezers.
4. Insert new lamp and replace lens.

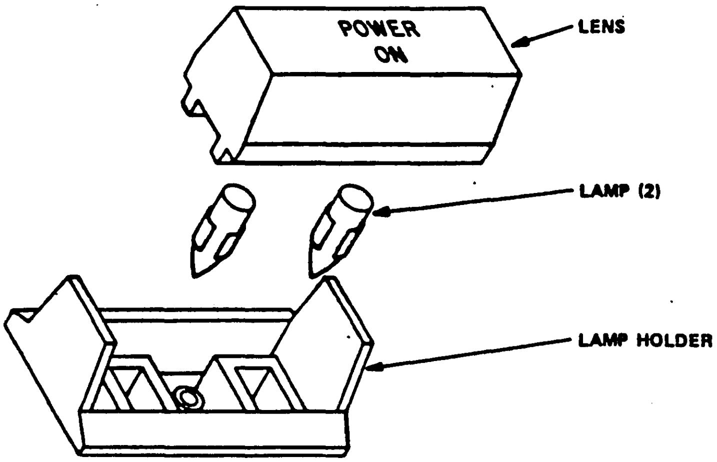

Figure 6B-10. POWER ON Indicator Details

PROCEDURE 8. PERCENTAGE METER REPLACEMENT

Refer to figure 6B-11 and perform the following steps to replace the percentage meter assembly:

1. Remove power from coupler (procedure 1).
2. Disconnect interconnecting cable from J1 METERING connector.

3. Remove four screws mounting meter assembly to front panel of +5 V power supply and lift meter assembly free of panel.

4. Connect cable removed in step 2 to J1 METERING connector of new meter assembly.

5. Apply power to coupler (procedure 1).

6. Perform meter calibration (procedure 2).

7. Mount new meter assembly to front panel of +5 V power supply.

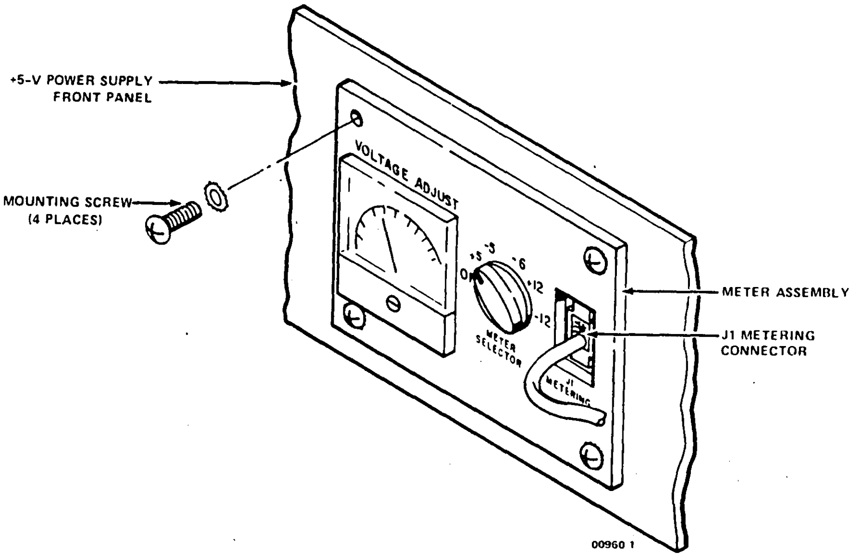

Figure 6B-11. Meter Assembly Mounting Details

PROCEDURE 9. AIRFLOW SENSOR RELAY INDICATOR REPLACEMENT

To replace the airflow sensor relay indicator, refer to figure 6B-12 and perform the following steps:

1. Turn coupler power off (procedure 1).

2. Remove front cover from blower assembly (6 screws).

3. Disconnect indicator wires from terminals TB1-3 and TB1-4.

4. Remove speed nut from sensor indicator, flex blower panel away from metal shield, and remove indicator.

5. Insert new indicator in blower panel and secure indicator with speed nut.

6. Attach spade lugs to indicator wires and connect lugs to terminals TB1-3 and TB1-4.

7. Reinstall blower assembly front cover.

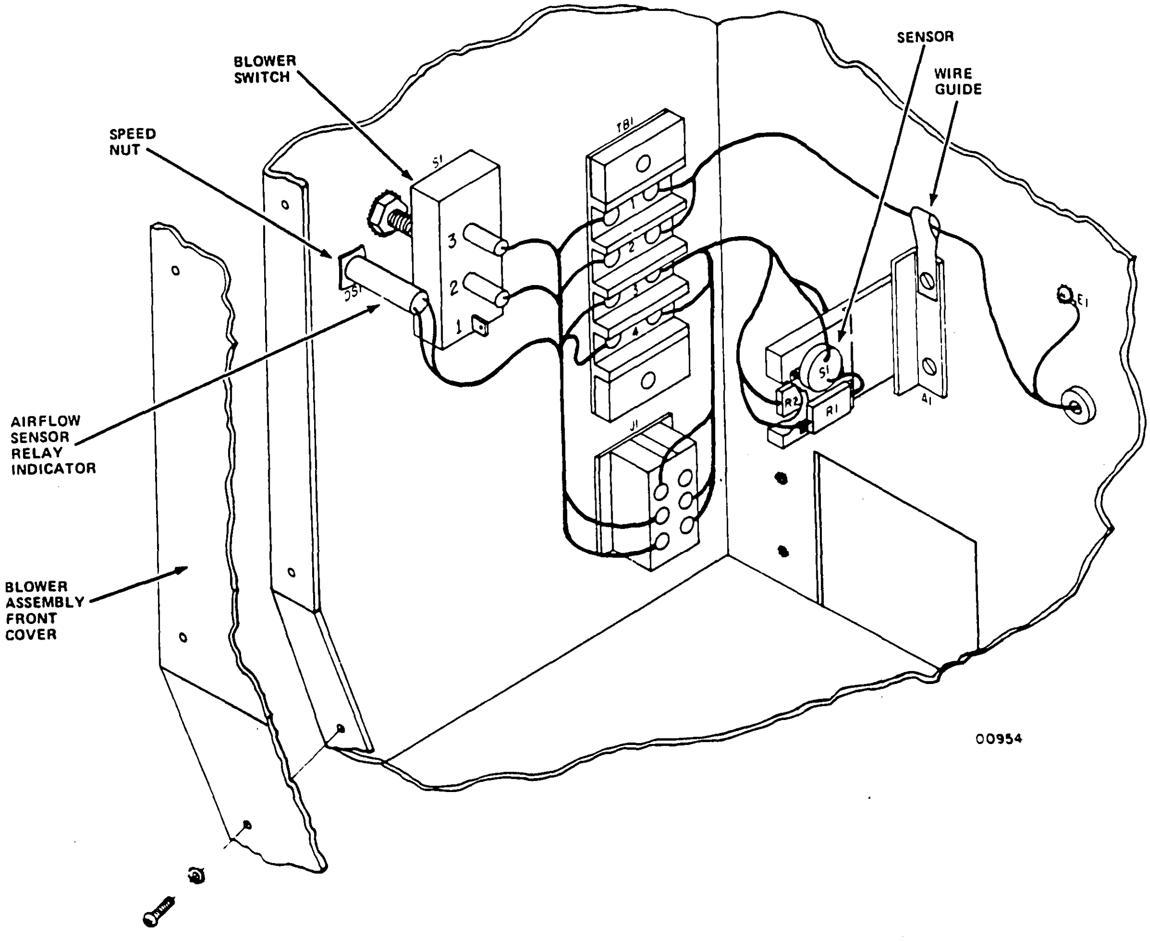

Figure 6B-12. Blower Assembly Component Mounting Details

PROCEDURE 10. AIRFLOW SENSOR REPLACEMENT

To replace the airflow sensor, refer to figure 6B-12 and perform the following steps:

1. Turn coupler power off (procedure 1).
2. Remove front cover from blower assembly (figure 6B-12).
3. Tag and unsolder or disconnect four wires from airflow sensor.
4. Remove old sensor and install new sensor.
5. Solder/connect wires to new sensor according to tags.
6. Reinstall blower assembly front cover.

PROCEDURE 11. BLOWER ASSEMBLY REPLACEMENT

To replace the blower assembly, perform the following steps:

1. Turn coupler power off (procedure 1).
2. Refer to figure 6B-12 and remove front cover from blower assembly.
3. Disconnect wires from terminals TB1-1, TB1-2, and E1. Remove black wire and white wire from wire guide.
4. Refer to figure 6B-13 and remove shroud from blower assembly.
5. Remove blower from mounting panel.
6. Insert wires from new blower through bushing in mounting panel.
7. Install new blower on mounting panel with hardware removed in step 4.
8. Pass black wire and white wire through wire guide (figure 6B-12) and connect blower wires as follows:

Wire	Connection
Green	E1
White	TB1-1
Black	TB1-2

8. Reinstall blower assembly front cover and shroud (figure 6B-13).

PROCEDURE 12. BLOWER SWITCH REPLACEMENT

To replace the blower switch, refer to figure 6B-12 and perform the following steps:

1. Turn coupler power off (procedure 1).
2. Remove front cover from blower assembly (figure 6B-12).
3. Tag and unsolder two wires attached to blower switch.
4. Loosen switch hex mounting nut from inside blower panel, remove knurled nut, and remove switch.
5. Place new switch in blower panel with flat side of threads facing up. Secure switch with knurled nut, lockwasher, and hex nut.
6. Solder wires to new switch according to tags.
7. Reinstall blower assembly front cover.

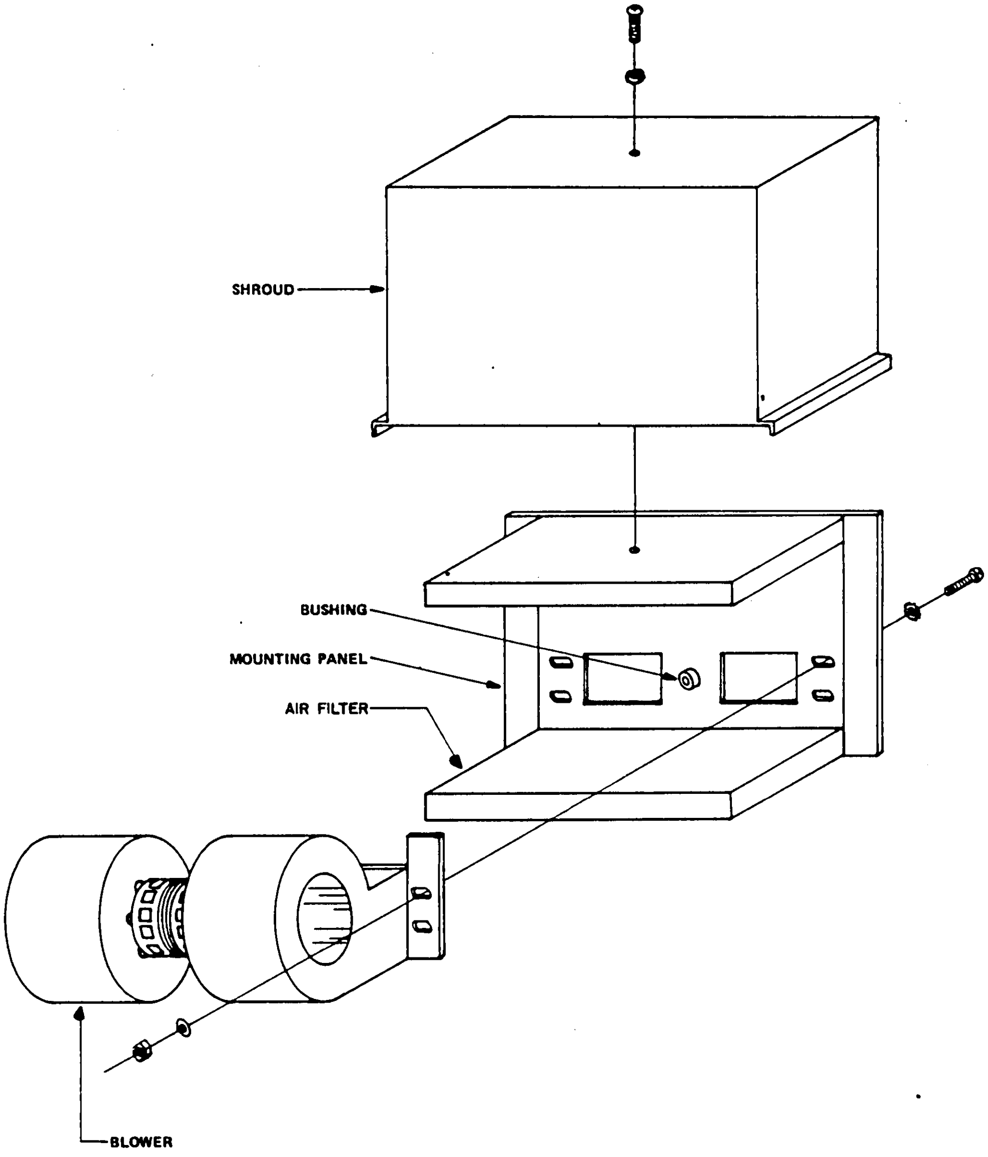

Figure 6B-13. Blower, Shroud, and Mounting Panel

PROCEDURE 13. EMI FILTER REPLACEMENT

To replace the EMI filter, refer to figure 6B-7 and perform the following steps:

1. Turn coupler power off (procedure 1).
2. Remove power distribution box rear cover (figure 6B-7).
3. Tag and disconnect four wires attached to EMI filter.
4. Remove EMI filter.
5. Install new EMI filter and connect wires removed in step 3.
6. Reinstall power distribution box rear cover.

PROCEDURE 14. 50/60-HZ POWER DISCONNECT SWITCH REPLACEMENT

To replace the 50/60-HZ POWER DISCONNECT switch, refer to figure 6B-14 and perform the following steps:

1. Turn coupler power off (procedure 1) and turn off site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler. It is suggested that a notice be fastened to these circuit breakers to inform personnel not to turn breakers on.
2. Remove plastic baffle and cabinet-mounted power supplies (procedure 16). Also remove power distribution box front and rear covers (figures 6B-14 and 6B-9, respectively).
3. Tag and disconnect six wires attached to 50/60-HZ POWER DISCONNECT switch (figure 6B-14).
4. Note mounting position of switch, loosen nut from inside of front panel, remove knurled nut on outside of front panel, and remove switch.
5. Place new switch in front panel in position noted in step 4. Secure new switch with knurled nut/lockwasher/nut.
6. Connect wires to new switch according to tags.
7. Reinstall power distribution box front and rear covers, cabinet-mounted power supplies, and plastic baffle.
8. Turn on site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler.
9. Turn coupler power on (procedure 1).

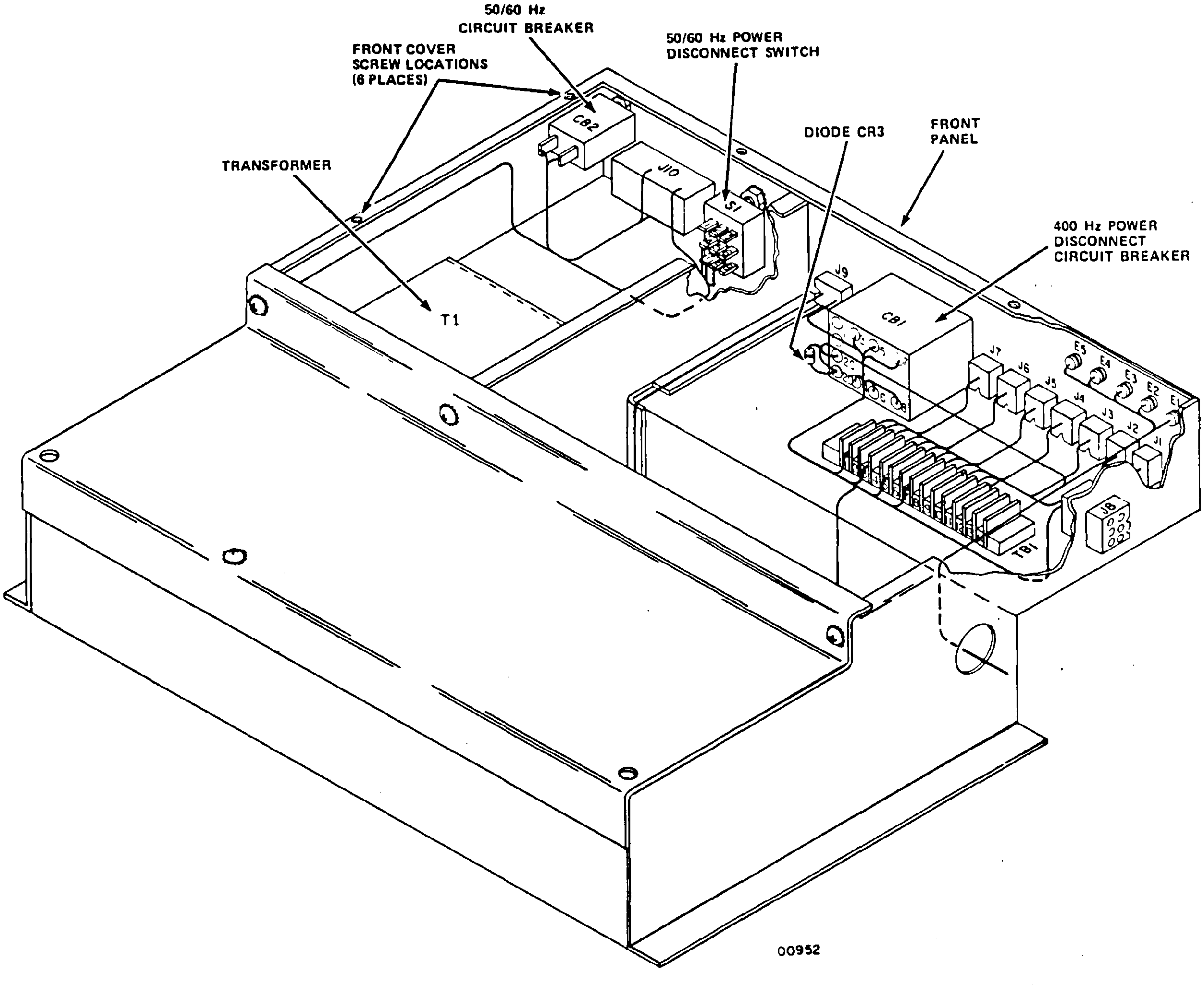
50/60 Hz CIRCUIT BREAKER
FRONT COVER SCREW LOCATIONS (6 PLACES)
50/60 Hz POWER DISCONNECT SWITCH
TRANSFORMER
DIODE CR3
FRONT PANEL
400 Hz POWER DISCONNECT CIRCUIT BREAKER
CB2
J10
S1
T1
J9
CB1
J7
J6
J5
J4
J3
J2
J1
E5
E4
E3
E2
E1
J8
TB1
00952

Figure 6B-14. Power Distribution Box Front Components

PROCEDURE 15. TRANSFORMER REPLACEMENT

To replace the input ac power transformmer, refer to figure 6B-14 and perform the following steps:

1. Turn coupler power off (procedure 1) and turn off site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler. It is suggested that a notice be fastened to these circuit breakers to inform personnel not to turn breakers on.
2. Remove cabinet-mounted power supplies (procedure 16).
3. Remove plastic baffle and power distribution box front and rear covers (figures 6B-14 and 6B-9, respectively).
4. Remove EMI filter (procedure 13).
5. Tag and disconnect five wires attached to transformer (figure 6B-14).
6. Remove fasteners that attach transformer and support to power distribution box. Lift transformer and support from power distribution box.
7. Detach transformer from support.
8. Attach new transformer to support. Install transformer and support in power distribution box.
9. Connect wires to new transformer according to tags.
10. Reinstall EMI filter (procedure 13), power distribution box front and rear covers (figures 6B-14 and 6B-9, respectively), and cabinet-mounted power supplies (procedure 16), and plastic baffle.
11. Turn on site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler.
12. Turn coupler power on (procedure 1).

PROCEDURE 16. POWER SUPPLY REPLACEMENT

Perform the following steps to replace either the -5 V power supply, +5 V slave power supply, or +5 V master power supply as applicable. Refer to figure 6B-2 for power supply details.

NOTE

Power supply replacement requires two people.

-5 V Power Supply

1. Turn coupler power off (procedure 1).
2. Refer to figure 6B-2. Remove power cables from terminal E1 and AC INPUT connector, and ground strap from terminal E2 at front of power supply.
3. Remove screws that attach power supply to front mounting brackets of cabinet. Slide power supply out rear of cabinet.

4. Install a replacement -5 V power supply per the reverse of the preceding steps.
5. Apply power to coupler (procedure 1) and adjust both -5 V DC ADJ and +5 V ADJUST controls until voltage percentage meter shows 0 percent for each adjustment.

+5 V Slave Power Supply

1. Turn coupler power off (procedure 1).
2. Refer to figure 6B-2. Remove cable from AC INPUT connector at front of +5 V slave power supply.
3. Remove rear cover from +5 V power supply.
4. Remove ground and power cables from terminals E3 and E4 at rear of power supply.

NOTE

> Black wire (negative) must be disconnected from rear of +5 V master power supply in order to remove +5 V slave power supply out rear of cabinet.

5. Remove screws that attach power supply to mounting brackets at front of cabinet. Slide power supply out rear of cabinet.
6. Install a replacement +5 V slave power supply per the reverse of the preceding steps.
7. Apply power to coupler (procedure 1) and adjust both -5 V DC ADJ and +5 V ADJUST controls until voltage percentage meter shows 0 percent for each adjustment.

+5 V Master Power Supply

1. Turn coupler power off (procedure 1).
2. Refer to figure 6B-2. Remove cables from J1 METERING, J1 AC INPUT, and J2 connectors at front of +5 V master power supply.
3. Remove rear cover from power supply.
4. Remove ground and power cables from terminals E3 and E4 at back of power supply.
5. Remove four screws that attach power supply to mounting brackets at front of cabinet. Slide power supply out front of cabinet.
6. Install a replacement +5 V master power supply per the reverse of the preceding steps.
7. Apply power to coupler (procedure 1) and adjust both -5 V DC ADJ and +5 V ADJUST controls until voltage percentage meter shows 0 percent for each adjustment.

PROCEDURE 17. 400-HZ POWER RELAY REPLACEMENT

To replace the 400-Hz power relay (K3) in the power distribution box, refer to figure 6B-9 and perform the following steps:

1. Turn coupler power off (procedure 1) and turn off site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler. It is suggested that a notice be fastened to these circuit breakers to inform personnel not to turn breakers on.
2. Remove cabinet-mounted power supplies (procedure 16).
3. Remove plastic baffle and power distribution box rear cover (figure 6B-9).
4. Tag and disconnect eight wires attached to 400-Hz power relay.
5. Remove power relay and install new relay.
6. Connect wires to new relay according to tags.
7. Reinstall power distribution box front and rear covers, cabinet-mounted power supplies (procedure 16), and plastic baffle.
8. Turn on wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler and apply power to coupler (procedure 1).

PROCEDURE 18. 400-HZ CIRCUIT BREAKER REPLACEMENT

To replace the 400-Hz circuit breaker in the power distribution box, refer to figure 6B-14 and perform the following steps:

1. Turn coupler power off (procedure 1) and turn off site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler. It is suggested that a notice be fastened to these circuit breakers to inform personnel not to turn breakers on.
2. Remove cabinet-mounted power supplies (procedure 16).
3. Remove plastic baffle and power distribution box front cover (figure 6B-14).
4. Tag and disconnect eight wires attached to 400-HZ POWER DISCONNECT circuit breaker.
5. Remove circuit breaker.
6. Transfer diode CR3 from old circuit breaker to new one; maintain same diode polarity.
7. Install new circuit breaker.
8. Connect wires to new circuit breaker according to tags.
9. Reinstall power distribution box front and rear covers, cabinet-mounted power supplies (procedure 16), and plastic baffle.
10. Turn on wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler and apply power to coupler (procedure 1).

PROCEDURE 19. 400-HZ CONTROL RELAY REPLACEMENT

To replace the 400-Hz control relay (K1) in the power distribution box, refer to figure 6B-9 and perform the following steps:

1. Turn coupler power off (procedure 1) and turn off site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler. It is suggested that a notice be fastened to these circuit breakers to inform personnel not to turn breakers on.
2. Remove cabinet-mounted power supplies (procedure 16).
3. Remove power distribution box rear cover (figure 6B-9).
4. Remove 400-Hz control relay from socket K1, and insert new relay.
5. Reinstall cabinet-mounted power supplies and power distribution box rear cover.
6. Turn on wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler and apply power to coupler (procedure 1).

PROCEDURE 20. DIODE CR1 REPLACEMENT

To replace diode CR1 in the power distribution box, refer to figure 6B-9 and perform the following steps:

1. Turn coupler power off (procedure 1) and turn off site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler. It is suggested that a notice be fastened to these circuit breakers to inform personnel not to turn breakers on.
2. Remove cabinet-mounted power supplies (procedure 16).
3. Remove power distribution box rear cover (figure 6B-9).
4. Remove screws mounting relay support bracket and rotate bracket to gain access to diode CR1.
5. Unsolder diode CR1 leads connected to TB3-2 and TB3-3.
6. Place 12 mm (0.5 in) of sleeve insulation on each lead of new diode and trim leads to appropriate length.
7. Solder negative (band) lead of new diode to TB3-3 and other lead to TB3-2.
8. Mount relay support bracket to power distribution box.
9. Install cabinet-mounted power supplies and power distribution box rear cover.
10. Turn on wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler and apply power to coupler (procedure 1).

PROCEDURE 21. CAPACITOR C1 REPLACEMENT

To replace capacitor C1 in the power distribution box, refer to figure 6B-9 and perform the following steps:

1. Turn coupler power off (procedure 1) and turn off site wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler. It is suggested that a notice be fastened to these circuit breakers to inform personnel not to turn breakers on.
2. Remove cabinet-mounted power supplies (procedure 16).
3. Remove power distribution box rear cover (figure 6B-9).
4. Remove screws mounting relay support bracket and rotate bracket to gain access to capacitor C1.
5. Unsolder capacitor leads connected to relay socket terminals K1-1 and K1-7.
6. Cut tie wrap and remove capacitor C1 from relay support.
7. Attach new capacitor to relay support with tie wrap.
8. Place sleeve insulation on each lead of new capacitor and trim lead to appropriate length.
9. Solder negative lead of capacitor to K1-1 and positive lead to K1-7.
10. Mount relay support bracket to power distribution box.
11. Install cabinet-mounted power supplies and power distribution box rear cover.
12. Turn on wall-mounted 50/60-Hz and 400-Hz circuit breakers feeding coupler and apply power to coupler (procedure 1).

PROCEDURE 22. FIPS DEVICE INTERFACE CONNECTOR PIN EXTRACTION

To remove pins from the FIPS device I/O connectors, use a CDC part number 86732402 extractor tool and perform the following steps:

1. Move handle of extractor tool to back end of tool.
2. Approach from front side of connector block and insert front end of extractor tool between the two prongs of connector pin.
3. Slide handle toward front of extractor tool to release connector pin catch from connector.
4. Remove pin through back side of connector block.
5. Install a replacement connector pin (CDC part number 94355103) into back side of connector by hand.

PROCEDURE 23. MAINTENANCE PANEL COMPONENTS REPLACEMENT

To replace components on the coupler maintenance panel, refer to figure 6B-15 for component placement details and perform the following steps as applicable:

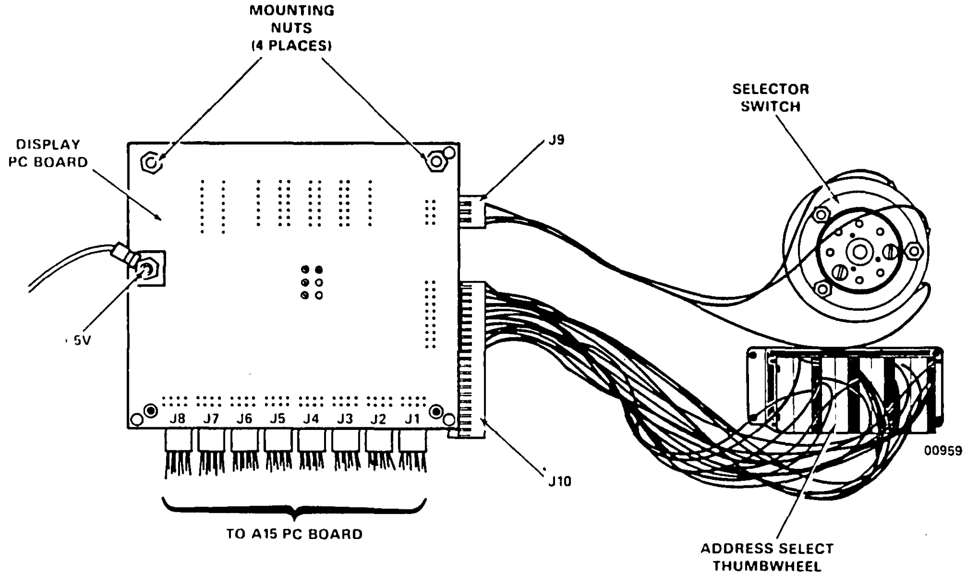

Figure 6B-15. Maintenance Panel Assembly Details

Display PC Board

1. Turn coupler power off (procedure 1).
2. Disconnect +5 V power lead from rear of display PC board.

NOTE

> Make sure to tag connectors removed in the following step in such a manner as to ensure correct pin placement when reconnecting. Connectors can be plugged in the wrong way.

3. Tag and disconnect connectors J1 through J10 from display PC board.
4. Remove four mounting nuts from rear on display PC board and lift board away from panel.
5. Install a replacement PC board per reverse of this procedure.

A, ON-LINE, B Selector Switch

1. Turn coupler power off (procedure 1).

NOTE

Make sure to tag connector removed in the following step in such a manner as to ensure correct pin placement when reconnecting. Connector can be plugged in the wrong way.

2. Tag and disconnect connector J9 from display PC board.

3. Loosen screw fastening switch knob to selector switch and remove knob.

4. Remove hex mounting nut and lock washer from front of switch and remove switch.

5. Install a replacement selector switch per the reverse of this of this procedure.

ADDRESS SELECT Thumbwheel

1. Turn coupler power off (procedure 1).

NOTE

Make sure to tag connector removed in the following step in such a manner as to ensure correct pin placement when reconnecting. Connector can be plugged in the wrong way.

2. Tag and disconnect connector J10 from display PC board.

3. Loosen screw fastening switch knob to selector switch and remove knob.

4. Remove four screws mounting thumbwheel to front of maintenance panel.

5. Install a replacement thumbwheel per the reverse of this procedure.

PROCEDURE 24. LOGIC CARD REPLACEMENT

To replace logic cards in the coupler logic rack, perform the following steps:

1. Turn 400-HZ POWER DISCONNECT circuit breaker OFF (procedure 1).

2. Squeeze retaining fasteners on metal cover plate at front of logic chassis and swing cover plate down to access logic cards.

3. Rotate upper and lower card cams simultaneously to disconnect card from backpanel connector.

4. Slide card out of logic rack.

5. Install replacement card in logic rack card slots with component side of board facing right.

6. Position card cams into cam grooves and rotate cams simultaneously to seat card into backpanel connector.

7. Turn 400-HZ POWER DISCONNECT circuit breaker ON.

PARTS DATA 7

This section lists the recommended replaceable electrical parts for the CYBER channel coupler.

PROD FR205A PROD P/N 24620066 DESC FR205-A, CYBER CHANNEL COUPLER

LINE NUMBER	--PART NUMBER--	----------DESCRIPTION---------	REVISION
114	18752831	CONNECTOR, COAXIAL MULTIPLE POS	AB
115	18874300	MARKER, IDENT-CABLE STRAP	B
116	24567000	CABLE, COAXIAL 19 COND. 73OHM	K
138	10354441	CABLE ASSEMBLY 6 PIN DBL INSUL	C
147	10354443	CABLE ASSEMBLY 6 PIN DBL INSUL	C
156	10354457	CABLE ASSEMBLY 9 PIN DBL INSUL	D
183	94380204	INDICATOR - ILLUMINATED PANEL	L
184	94380400	LAMP - INCANDESCENT, MINIATURE	C
185	94380800	LENS-LETTERED	AP
186	10354781	POWER ON LIGHT CABLE ASSEMBLY	E
197	10355023	BLOWER ASSEMBLY	E
198	00815469	FILTER WASHABLE	BW
199	00816700	BLOWER 523 C.F.M.	K
226	24571702	SWITCH TOGGLE TWO POSITION SP	E
228	51713900	LIGHT, NEON INDICATOR 1/3 WATT	B
233	53915602	AIR FLOW SENSOR ASSY	G
243	51808104	SWITCH THERMAL 120 VAC 130 F	L
306	22936935	POWER DISTRIBUTION BOX ASSY	E
327	18287502	DIODE, SILICON DIFFUSED JUNCTIO	F
330	18440702	CKT BREAKER 4 POLE AUX SWITCH	V
331	18565200	RELAY, 25AMP (3P SINGLE THROW)	E
333	18890003	CAP FXD ALUM 40VDC 750 UF	L
386	24550802	RELAY, OCTAL SOCKET	N
402	53973800	TRANSFORMER STEP DOWN .75KVA	E
405	96744777	FILTER-RFI LOW LEAKAGE	B
406	97022400	SWITCH-TOGGLE, 3PDT	D
608	67310400	PWR SUPPLY ASSY MASTER 5V 100A	G
632	51731101	CIRCUIT BREAKER 2 AMP	D
777	22106391	PCB ASSY-MAINTENANCE	A
912	22114772	MOD ASSY-CYBER STATUS CLOCKS	A
945	22120958	MOD ASSY FIPS 4	A
1012	22179490	PC BD ASSY-CY DATA BUS I/F	A
1067	23140103	PRINTED CKT BD ASSY-CYB CH I/F	A
1104	52681115	MODULE ASSEMBLY NAD MEMORY BD	C
1120	52803441	MOD ASSY PROCESSOR CONTROL	C
1187	53590727	MOD ASSY PROM LOGIC	A
1239	53590866	PRINTED CKT BD ASSY-FIPS #3	A
1266	53595819	MOD ASSY PROCESSOR ALU	C

PROD FV720A PROD P/N 24620065 DESC FV720-A, CYBER CHANNEL CPLR OPT

LINE NUMBER	--PART NUMBER--	---------DESCRIPTION---------	REVISION
18	18752831	CONNECTOR, COAXIAL MULTIPLE POS	AB
19	18874300	MARKER, IDENT-CABLE STRAP	B
20	24567000	CABLE, COAXIAL 19 COND., 73OHM	K
124	22114772	MOD ASSY-CYBER STATUS CLOCKS	A
157	10283690	MOD ASSY FIPS 4	A
224	22179490	PC BD ASSY-CY DATA BUS I/F	A
279	23140103	PRINTED CKT BD ASSY-CYB CH I/F	A
399	53590727	MOD ASSY PROM LOGIC	A
451	53590866	PRINTED CKT BD ASSY-FIPS #3	A

WIRE LISTS 8

This section contains the logic chassis wire list or "cross tabs" for the backpanel, and also contains cable tab listings for the I/O cables. The cross tabs show the physical backpanel wiring destinations for each logic module pin. The cable tabs list the cable connections between the backpanel and the FIPS device and CYBER channel I/O connectors.

```
PAGE     1  PACK        A01
     ORIGIN        LEVS      DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV

     A01-1A03/1C03  11        A05-2B03/2D03   11     9   A05B53                  A
     A01-1A04/1C04  11        A04-1B04/1D04   11     4   A05B72                  A
     A01-1A07/1C07  11        A02-1A04/1C04   11     3   A05A04                  A
     A01-1A14/1C14  11        A05-2A08/2C08   11     8   A01A14                  A
     A01-1A19/1C19  11        A05-2B17/2D17   11     8   A05B67                  A
     A01-1A20/1C20  11        A05-1A36/1C36   11     5   A01A20                  A
     A01-1A22/1C22  11        A05-1A33/1C33   11     5   A05A33                  A
     A01-1A29/1C29  11        A05-2A05/2C05   11     6   A01A29                  A
     A01-1A35/1C35  11        A05-1A34/1C34   11     5   A02A74                  A
     A01-1A37/1C37  11        A02-1A37/1C37   11     3   A01A37                  A
     A01-1A38/1C38  11        A02-1A38/1C38   11     3   A01A38                  A
     A01-1A40/1C40  11        A02-1A40/1C40   11     3   A01A40                  A
     A01-1A41/1C41  11        A02-1A41/1C41   11     3   A01A41                  A
     A01-1A42/1C42  11        A02-1A42/1C42   11     3   A01A42                  A
     A01-1A43/1C43  11        A02-1A43/1C43   11     3   A01A43                  A
     A01-1B03/1D03  11        A05-1B43/1D43   11     7   A01B03                  A
     A01-1B04/1D04  11        A05-1A41/1C41   11     7   A01B04                  A
     A01-1B14/1D14  11        A05-2A07/2C07   11     8   A01B14                  A
     A01-1B15/1D15  11        A02-2A42/2C42   11    11   A01B15                  A
     A01-1B19/1D19  11        A02-2B30/2D30   11     9   A01B19                  A
     A01-1B22/1D22  11        A05-2B16/2D16   11     8   A05B66                  A
     A01-1B29/1D29  11        A02-2A41/2C41   11     9   A01B29                  A
     A01-1B30/1D30  11        A02-2B32/2D32   11     6   A01B30                  A
     A01-1B37/1D37  11        A02-1B37/1D37   11     3   A01B37                  A
     A01-1B38/1D38  11        A02-1B38/1D38   11     3   A01B38                  A
     A01-1B40/1D40  11        A02-1B40/1D40   11     3   A01B40                  A
     A01-1B41/1D41  11        A02-1B41/1D41   11     3   A01B41                  A
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PAGE     2  PACK         A01
     ORIGIN          LEVS      DESTINATION       LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A01-1B42/1D42  11         A02-1B42/1D42  11     3   A01B42                  A
     A01-1B43/1D43  11         A02-1B43/1D43  11     3   A01B43                  A
     A01-2A04/2C04  11         A05-2B10/2D10  11     5   A05B60                  A
     A01-2A09/2C09  11         A05-2A27/2C27  11     5   A01A59                  A
     A01-2A15/----             A01-2C15/----             GRNDXX                  A
     A01-2A19/----             A01-2C19/----             GRNDXX                  A
     A01-2A27/----             A01-2C27/----             GRNDXX                  A
     A01-2A31/----             A01-2C31/----             GRNDXX                  A
     A01-2A35/----             A01-2C35/----             GRNDXX                  A
     A01-2A43/----             A01-2C43/----             GRNDXX                  A
     A01-2B04/2D04  11         A02-2A36/2C36  11     6   A01B54                  A
     A01-2B09/2D09  11         A02-2A38/2C38  11     5   A05A74                  A
     A01-2B10/2D10  11         A05-2B25/2D25  11     5   A05B75                  A
     A01-2B13/2D13  11         A05-2A21/2C21  11     5   A01B63                  A
     A01-2B14/2D14  11         A04-2A26/2C26  11     4   A04A76                  A
     A01-2B15/----             A01-2D15/----             GRNDXX                  A
     A01-2B19/----             A01-2D19/----             GRNDXX                  A
     A01-2B27/----             A01-2D27/----             GRNDXX                  A
     A01-2B31/----             A01-2D31/----             GRNDXX                  A
     A01-2B35/----             A01-2D35/----             GRNDXX                  A
     A01-2B43/----             A01-2D43/----             GRNDXX                  A
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PAGE      3  PACK        A02
     ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS  REV

     A02-1A03/1C03   11         A05-1A03/1C03   11      4    A05A03                  A

     A02-1A04/1C04   11         A01-1A07/1C07   11      3    A05A04                  A
     A02-1A04/1C04   22         A05-1A04/1C04   22      4    A05A04                  A

     A02-1A05/1C05   11         A05-1A05/1C05   11      4    A05A05                  A

     A02-1A07/1C07   11         A05-1A07/1C07   11      4    A05A07                  A

     A02-1A08/1C08   11         A05-1A08/1C08   11      4    A05A08                  A

     A02-1A09/1C09   11         A05-1A09/1C09   11      4    A05A09                  A

     A02-1A10/1C10   11         A05-1A10/1C10   11      4    A05A10                  A

     A02-1A11/1C11   11         A05-1A11/1C11   11      4    A05A11                  A

     A02-1A12/1C12   11         A05-1A12/1C12   11      4    A05A12                  A

     A02-1A13/1C13   11         A05-1A13/1C13   11      4    A05A13                  A

     A02-1A14/1C14   11         A05-1A14/1C14   11      4    A05A14                  A

     A02-1A15/1C15   11         A05-1A15/1C15   11      4    A05A15                  A

     A02-1A16/1C16   11         A05-1A16/1C16   11      4    A05A16                  A

     A02-1A19/1C19   11         A05-1B42/1D42   11      6    A02A19                  A

     A02-1A20/1C20   11         A14-2A32/2C32   11     12    A14A82                  A

     A02-1A21/1C21   11         A05-2A14/2C14   11      8    A05A64                  A

     A02-1A24/1C24   11         A04-1A24/1C24   11      4    A04A24                  A

     A02-1A25/1C25   11         A04-1A25/1C25   11      4    A04A25                  A

     A02-1A26/1C26   11         A04-1A26/1C26   11      4    A04A26                  A

     A02-1A27/1C27   11         A04-1A27/1C27   11      4    A04A27                  A

     A02-1A28/1C28   11         A04-1A28/1C28   11      4    A04A28                  A

     A02-1A29/1C29   11         A04-1A29/1C29   11      4    A04A29                  A

     A02-1A30/1C30   11         A04-1A30/1C30   11      4    A04A30                  A

     A02-1A31/1C31   11         A04-1A31/1C31   11      4    A04A31                  A

     A02-1A35/1C35   11         A05-2B07/2D07   11      6    A05B57                  A

     A02-1A37/1C37   11         A01-1A37/1C37   11      3    A01A37                  A
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PAGE     4  PACK       A02

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A02-1A38/1C38   11         A01-1A38/1C38    11     3     A01A38                   A
     A02-1A40/1C40   11         A01-1A40/1C40    11     3     A01A40                   A
     A02-1A41/1C41   11         A01-1A41/1C41    11     3     A01A41                   A
     A02-1A42/1C42   11         A01-1A42/1C42    11     3     A01A42                   A
     A02-1A43/1C43   11         A01-1A43/1C43    11     3     A01A43                   A
     A02-1B03/1D03   11         A05-1B03/1D03    11     4     A05B03                   A
     A02-1B08/1D08   11         A05-1B08/1D08    11     4     A05B08                   A
     A02-1B09/1D09   11         A05-1B09/1D09    11     4     A05B09                   A
     A02-1B10/1D10   11         A05-1B10/1D10    11     4     A05B10                   A
     A02-1B11/1D11   11         A05-1B11/1D11    11     4     A05B11                   A
     A02-1B12/1D12   11         A05-1B12/1D12    11     4     A05B12                   A
     A02-1B13/1D13   11         A05-1B13/1D13    11     4     A05B13                   A
     A02-1B14/1D14   11         A05-1B14/1D14    11     4     A05B14                   A
     A02-1B15/1D15   11         A05-1B15/1D15    11     4     A05B15                   A
     A02-1B16/1D16   11         A05-1B16/1D16    11     4     A05B16                   A
     A02-1B24/1D24   11         A04-1B24/1D24    11     4     A04B24                   A
     A02-1B25/1D25   11         A04-1B25/1D25    11     4     A04B25                   A
     A02-1B26/1D26   11         A04-1B26/1D26    11     4     A04B26                   A
     A02-1B27/1D27   11         A04-1B27/1D27    11     4     A04B27                   A
     A02-1B28/1D28   11         A04-1B28/1D28    11     4     A04B28                   A
     A02-1B29/1D29   11         A04-1B29/1D29    11     4     A04B29                   A
     A02-1B30/1D30   11         A04-1B30/1D30    11     4     A04B30                   A
     A02-1B31/1D31   11         A04-1B31/1D31    11     4     A04B31                   A
     A02-1B36/1D36   11         A14-2A17/2C17    11    10     A02B36                   A
     A02-1B37/1D37   11         A01-1B37/1D37    11     3     A01B37                   A
     A02-1B38/1D38   11         A01-1B38/1D38    11     3     A01B38                   A
     A02-1B40/1D40   11         A01-1B40/1D40    11     3     A01B40                   A
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PAGE     5  PACK        A02
      ORIGIN         LEVS      DESTINATION      LEVS  LTH   SIGNAL   CBL   COLORS  REV
      A02-1B41/1D41   11        A01-1B41/1D41   11     3    A01B41                  A

      A02-1B42/1D42   11        A01-1B42/1D42   11     3    A01B42                  A

      A02-1B43/1D43   11        A01-1B43/1D43   11     3    A01B43                  A

      A02-2A03/2C03   11        A04-2B20/2D20   11     5    A04B70                  A

      A02-2A07/2C07   11        A04-2A07/2C07   11     4    A04A57                  A

      A02-2A08/2C08   11        A04-2A08/2C08   11     4    A04A58                  A

      A02-2A09/2C09   11        A04-2A09/2C09   11     4    A04A59                  A

      A02-2A10/2C10   11        A04-2A10/2C10   11     4    A04A60                  A

      A02-2A11/2C11   11        A04-2A11/2C11   11     4    A04A61                  A

      A02-2A12/2C12   11        A04-2A12/2C12   11     4    A04A62                  A

      A02-2A13/2C13   11        A04-2A13/2C13   11     4    A04A63                  A

      A02-2A14/2C14   11        A04-2A14/2C14   11     4    A04A64                  A

      A02-2A20/2C20   11        A05-2A26/2C26   11     4    A02A70                  A

      A02-2A21/2C21   11        A15-2B19/2D19   11    11    A15B69                  A

      A02-2A22/2C22   11        A05-1A43/1C43   11     6    A05A43                  A

      A02-2A24/2C24   22        A05-1A34/1C34   22     7    A02A74                  A

      A02-2A25/2C25   11        A05-2A03/2C03   11     5    A05A53                  A

      A02-2A26/2C26   11        A04-2B34/2D34   11     4    A04B84                  A

      A02-2A34/2C34   11        A05-2A34/2C34   11     4    A05A84                  A

      A02-2A36/2C36   11        A01-2B04/2D04   11     6    A01B54                  A

      A02-2A37/2C37   11        A05-2A20/2C20   11     5    A05A70                  A

      A02-2A38/2C38   11        A01-2B09/2D09   11     5    A05A74                  A
      A02-2A38/2C38   22        A05-2A24/2C24   22     5    A05A74                  A

      A02-2A40/2C40   11        A05-2A15/2C15   11     6    A05A65                  A

      A02-2A41/2C41   11        A01-1B29/1D29   11     9    A01B29                  A
      A02-2A41/2C41   22        A05-1B35/1D35   22     9    A01B29                  A

      A02-2A42/2C42   11        A01-1B15/1D15   11    11    A01B15                  A

      A02-2A43/2C43   11        A04-2A25/2C25   11     5    A04A75                  A
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PAGE     6  PACK        A02

     ORIGIN         LEVS       DESTINATION     LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A02-2B04/2D04   11         A04-1B35/1D35   11     5   A04B35                 A

     A02-2B07/2D07   11         A04-2B07/2D07   11     4   A04B57                 A

     A02-2B08/2D08   11         A04-2B08/2D08   11     4   A04B58                 A

     A02-2B09/2D09   11         A04-2B09/2D09   11     4   A04B59                 A

     A02-2B10/2D10   11         A04-2B10/2D10   11     4   A04B60                 A

     A02-2B11/2D11   11         A04-2B11/2D11   11     4   A04B61                 A

     A02-2B12/2D12   11         A04-2B12/2D12   11     4   A04B62                 A

     A02-2B13/2D13   11         A04-2B13/2D13   11     4   A04B63                 A

     A02-2B14/2D14   11         A04-2B14/2D14   11     4   A04B64                 A

     A02-2B15/2D15   11         A04-1A35/1C35   11     6   A04A35                 A

     A02-2B16/2D16   11         A05-1B36/1D36   11     7   A02B66                 A

     A02-2B17/2D17   11         A05-2B18/2D18   11     4   A05B68                 A

     A02-2B18/2D18   11         A04-2A22/2C22   11     4   A04A72                 A

     A02-2B19/2D19   11         A14-1B37/1D37   11    11   A14B37                 A

     A02-2B27/2D27   11         A05-2A04/2C04   11     5   A02B77                 A

     A02-2B28/2D28   11         A05-2B15/2D15   11     5   A14B54                 A

     A02-2B29/2D29   11         A05-2B04/2D04   11     6   A02B79                 A

     A02-2B30/2D30   11         A01-1B19/1D19   11     9   A01B19                 A

     A02-2B31/2D31   11         A04-2B21/2D21   11     4   A04B71                 A

     A02-2B32/2D32   11         A01-1B30/1D30   11     6   A01B30                 A
     A02-2B32/2D32   22         A05-2B05/2D05   22     6   A01B30                 A

     A02-2B33/2D33   11         A05-2B33/2D33   11     4   A05B83                 A

     A02-2B34/2D34   11         A05-2B34/2D34   11     4   A05B84                 A

     A02-2B35/2D35   22         A05-2A05/2C05   22     6   A01A29                 A

     A02-2B42/2D42   22         A05-1A36/1C36   22     9   A01A20                 A

     A02-2B43/2D43   11         A05-1A35/1C35   11     9   A02B93                 A
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PAGE      7  PACK        A04

     ORIGIN          LEVS       DESTINATION       LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A04-1A12/1C12   11          A05-1A40/1C40    11      5    A05A40                   A

     A04-1A13/1C13   11          A04-1B34/1D34    11      5    A04B34                   A

     A04-1A24/1C24   11          A02-1A24/1C24    11      4    A04A24                   A
     A04-1A24/1C24   22          A05-1A24/1C24    22      3    A04A24                   A

     A04-1A25/1C25   11          A02-1A25/1C25    11      4    A04A25                   A
     A04-1A25/1C25   22          A05-1A25/1C25    22      3    A04A25                   A

     A04-1A26/1C26   11          A02-1A26/1C26    11      4    A04A26                   A
     A04-1A26/1C26   22          A05-1A26/1C26    22      3    A04A26                   A

     A04-1A27/1C27   11          A02-1A27/1C27    11      4    A04A27                   A
     A04-1A27/1C27   22          A05-1A27/1C27    22      3    A04A27                   A

     A04-1A28/1C28   11          A02-1A28/1C28    11      4    A04A28                   A
     A04-1A28/1C28   22          A05-1A28/1C28    22      3    A04A28                   A

     A04-1A29/1C29   11          A02-1A29/1C29    11      4    A04A29                   A
     A04-1A29/1C29   22          A05-1A29/1C29    22      3    A04A29                   A

     A04-1A30/1C30   11          A02-1A30/1C30    11      4    A04A30                   A
     A04-1A30/1C30   22          A05-1A30/1C30    22      3    A04A30                   A

     A04-1A31/1C31   11          A02-1A31/1C31    11      4    A04A31                   A
     A04-1A31/1C31   22          A05-1A31/1C31    22      3    A04A31                   A

     A04-1A32/1C32   11          A05-2B29/2D29    11      8    A05B79                   A

     A04-1A34/1C34   11          A05-1B22/1D22    11      4    A04A34                   A

     A04-1A35/1C35   11          A02-2B15/2D15    11      6    A04A35                   A

     A04-1A43/1C43   11          A05-1B38/1D38    11      3    A04A43                   A

     A04-1B03/1D03   11          A04-2B24/2D24    11     10    A04B74                   A

     A04-1B04/1D04   11          A01-1A04/1C04    11      4    A05B72                   A
     A04-1B04/1D04   22          A04-2A34/2C34    22     11    A05B72                   A

     A04-1B24/1D24   11          A02-1B24/1D24    11      4    A04B24                   A
     A04-1B24/1D24   22          A05-1B24/1D24    22      3    A04B24                   A

     A04-1B25/1D25   11          A02-1B25/1D25    11      4    A04B25                   A
     A04-1B25/1D25   22          A05-1B25/1D25    22      3    A04B25                   A

     A04-1B26/1D26   11          A02-1B26/1D26    11      4    A04B26                   A
     A04-1B26/1D26   22          A05-1B26/1D26    22      3    A04B26                   A

     A04-1B27/1D27   11          A02-1B27/1D27    11      4    A04B27                   A
     A04-1B27/1D27   22          A05-1B27/1D27    22      3    A04B27                   A
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PAGE     8  PACK        A04

     ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A04-1B28/1D28   11          A02-1B28/1D28   11     4    A04B28                    A
     A04-1B28/1D28   22          A05-1B28/1D28   22     3    A04B28                    A

     A04-1B29/1D29   11          A02-1B29/1D29   11     4    A04B29                    A
     A04-1B29/1D29   22          A05-1B29/1D29   22     3    A04B29                    A

     A04-1B30/1D30   11          A02-1B30/1D30   11     4    A04B30                    A
     A04-1B30/1D30   22          A05-1B30/1D30   22     3    A04B30                    A

     A04-1B31/1D31   11          A02-1B31/1D31   11     4    A04B31                    A
     A04-1B31/1D31   22          A05-1B31/1D31   22     3    A04B31                    A

     A04-1B33/1D33   11          A05-2A28/2C28   11     8    A04B33                    A

     A04-1B34/1D34   11          A04-1A13/1C13   11     5    A04B34                    A

     A04-1B35/1D35   11          A02-2B04/2D04   11     5    A04B35                    A

     A04-2A03/2C03   11          A05-2A13/2C13   11     4    A05A63                    A

     A04-2A05/2C05   11          A05-1A38/1C38   11     5    A04A55                    A

     A04-2A07/2C07   11          A02-2A07/2C07   11     4    A04A57                    A

     A04-2A08/2C08   11          A02-2A08/2C08   11     4    A04A58                    A

     A04-2A09/2C09   11          A02-2A09/2C09   11     4    A04A59                    A

     A04-2A10/2C10   11          A02-2A10/2C10   11     4    A04A60                    A

     A04-2A11/2C11   11          A02-2A11/2C11   11     4    A04A61                    A

     A04-2A12/2C12   11          A02-2A12/2C12   11     4    A04A62                    A

     A04-2A13/2C13   11          A02-2A13/2C13   11     4    A04A63                    A

     A04-2A14/2C14   11          A02-2A14/2C14   11     4    A04A64                    A

     A04-2A17/2C17   11          A05-1A42/1C42   11     6    A05A42                    A

     A04-2A20/2C20   11          A05-2A25/2C25   11     3    A04A70                    A

     A04-2A21/2C21   11          A05-1B34/1D34   11     7    A04A71                    A

     A04-2A22/2C22   11          A02-2B18/2D18   11     4    A04A72                    A

     A04-2A25/2C25   11          A02-2A43/2C43   11     5    A04A75                    A

     A04-2A26/2C26   11          A01-2B14/2D14   11     4    A04A76                    A

     A04-2A27/2C27   11          A05-2A18/2C18   11     4    A04A77                    A

     A04-2A30/2C30   11          A05-2A30/2C30   11     3    A05A80                    A
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PAGE     9  PACK        A04

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS  REV

     A04-2A31/2C31   11          A05-2A31/2C31   11      3   A05A81                  A

     A04-2A32/2C32   11          A05-1B41/1D41   11      7   A05B41                  A

     A04-2A33/2C33   11          A05-1B17/1D17   11     10   A04A83                  A

     A04-2A34/2C34   11          A05-2B22/2D22   11      4   A05B72                  A
     A04-2A34/2C34   22          A04-1B04/1D04   22     11   A05B72                  A

     A04-2A35/2C35   11          A05-2A35/2C35   11      3   A05A85                  A

     A04-2A36/2C36   11          A05-2A36/2C36   11      3   A05A86                  A

     A04-2A37/2C37   11          A05-2A37/2C37   11      3   A05A87                  A

     A04-2A38/2C38   11          A05-2A38/2C38   11      3   A05A88                  A

     A04-2A40/2C40   11          A05-2A40/2C40   11      3   A05A90                  A

     A04-2A41/2C41   11          A05-2A41/2C41   11      3   A05A91                  A

     A04-2A42/2C42   11          A05-2A42/2C42   11      3   A05A92                  A

     A04-2A43/2C43   11          A05-2A43/2C43   11      3   A05A93                  A

     A04-2B07/2D07   11          A02-2B07/2D07   11      4   A04B57                  A

     A04-2B08/2D08   11          A02-2B08/2D08   11      4   A04B58                  A

     A04-2B09/2D09   11          A02-2B09/2D09   11      4   A04B59                  A

     A04-2B10/2D10   11          A02-2B10/2D10   11      4   A04B60                  A

     A04-2B11/2D11   11          A02-2B11/2D11   11      4   A04B61                  A

     A04-2B12/2D12   11          A02-2B12/2D12   11      4   A04B62                  A

     A04-2B13/2D13   11          A02-2B13/2D13   11      4   A04B63                  A

     A04-2B14/2D14   11          A02-2B14/2D14   11      4   A04B64                  A

     A04-2B20/2D20   11          A02-2A03/2C03   11      5   A04B70                  A

     A04-2B21/2D21   11          A02-2B31/2D31   11      4   A04B71                  A

     A04-2B22/2D22   11          A05-1A17/1C17   11      9   A04B72                  A

     A04-2B24/2D24   11          A04-1B03/1D03   11     10   A04B74                  A

     A04-2B25/2D25   11          A13-1B31/1D31   11     10   A04B75                  A

     A04-2B26/2D26   11          A05-2B24/2D24   11      3   A04B76                  A

     A04-2B27/2D27   11          A05-2A19/2C19   11      3   A04B77                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A04-2B30/2D30	11	A05-2B30/2D30	11	3	A05B80			A
A04-2B31/2D31	11	A05-2B31/2D31	11	3	A05B81			A
A04-2B33/2D33	11	A05-2B12/2D12	11	5	A04B83			A
A04-2B34/2D34	11	A02-2A26/2C26	11	4	A04B84			A
A04-2B34/2D34	22	A05-2A09/2C09	22	5	A04B84			A
A04-2B35/2D35	11	A05-2B35/2D35	11	3	A05B85			A
A04-2B36/2D36	11	A05-2B36/2D36	11	3	A05B86			A
A04-2B37/2D37	11	A05-2B37/2D37	11	3	A05B87			A
A04-2B38/2D38	11	A05-2B38/2D38	11	3	A05B88			A
A04-2B40/2D40	11	A05-2B40/2D40	11	3	A05B90			A
A04-2B41/2D41	11	A05-2B41/2D41	11	3	A05B91			A
A04-2B42/2D42	11	A05-2B42/2D42	11	3	A05B92			A
A04-2B43/2D43	11	A05-2B43/2D43	11	3	A05B93			A

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PAGE     11  PACK         A05

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A05-1A03/1C03   11          A02-1A03/1C03   11      4    A05A03                    A
     A05-1A03/1C03   22          A07-1A03/1C03   22      4    A05A03                    A

     A05-1A04/1C04   11          A07-1A04/1C04   11      4    A05A04                    A
     A05-1A04/1C04   22          A02-1A04/1C04   22      4    A05A04                    A

     A05-1A05/1C05   11          A02-1A05/1C05   11      4    A05A05                    A
     A05-1A05/1C05   22          A07-1A05/1C05   22      4    A05A05                    A

     A05-1A07/1C07   11          A02-1A07/1C07   11      4    A05A07                    A
     A05-1A07/1C07   22          A07-1A07/1C07   22      4    A05A07                    A

     A05-1A08/1C08   11          A02-1A08/1C08   11      4    A05A08                    A
     A05-1A08/1C08   22          A07-1A08/1C08   22      4    A05A08                    A

     A05-1A09/1C09   11          A02-1A09/1C09   11      4    A05A09                    A
     A05-1A09/1C09   22          A07-1A09/1C09   22      4    A05A09                    A

     A05-1A10/1C10   11          A02-1A10/1C10   11      4    A05A10                    A
     A05-1A10/1C10   22          A07-1A10/1C10   22      4    A05A10                    A

     A05-1A11/1C11   11          A02-1A11/1C11   11      4    A05A11                    A
     A05-1A11/1C11   22          A07-1A11/1C11   22      4    A05A11                    A

     A05-1A12/1C12   11          A02-1A12/1C12   11      4    A05A12                    A
     A05-1A12/1C12   22          A07-1A12/1C12   22      4    A05A12                    A

     A05-1A13/1C13   11          A02-1A13/1C13   11      4    A05A13                    A
     A05-1A13/1C13   22          A07-1A13/1C13   22      4    A05A13                    A

     A05-1A14/1C14   11          A02-1A14/1C14   11      4    A05A14                    A
     A05-1A14/1C14   22          A07-1A14/1C14   22      4    A05A14                    A

     A05-1A15/1C15   11          A02-1A15/1C15   11      4    A05A15                    A
     A05-1A15/1C15   22          A07-1A15/1C15   22      4    A05A15                    A

     A05-1A16/1C16   11          A02-1A16/1C16   11      4    A05A16                    A
     A05-1A16/1C16   22          A07-1A16/1C16   22      4    A05A16                    A

     A05-1A17/1C17   11          A04-2B22/2D22   11      9    A04B72                    A

     A05-1A22/1C22   22          A15-2B19/2D19   22     11    A15B69                    A

     A05-1A24/1C24   22          A04-1A24/1C24   22      3    A04A24                    A

     A05-1A25/1C25   22          A04-1A25/1C25   22      3    A04A25                    A

     A05-1A26/1C26   22          A04-1A26/1C26   22      3    A04A26                    A

     A05-1A27/1C27   22          A04-1A27/1C27   22      3    A04A27                    A

     A05-1A28/1C28   22          A04-1A28/1C28   22      3    A04A28                    A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A05-1A29/1C29	22	A04-1A29/1C29	22	3	A04A29			A
A05-1A30/1C30	22	A04-1A30/1C30	22	3	A04A30			A
A05-1A31/1C31	22	A04-1A31/1C31	22	3	A04A31			A
A05-1A33/1C33	11	A01-1A22/1C22	11	5	A05A33			A
A05-1A34/1C34	11	A01-1A35/1C35	11	5	A02A74			A
A05-1A34/1C34	22	A02-2A24/2C24	22	7	A02A74			A
A05-1A35/1C35	11	A02-2B43/2D43	11	9	A02B93			A
A05-1A36/1C36	11	A01-1A20/1C20	11	5	A01A20			A
A05-1A36/1C36	22	A02-2B42/2D42	22	9	A01A20			A
A05-1A38/1C38	11	A04-2A05/2C05	11	5	A04A55			A
A05-1A40/1C40	11	A04-1A12/1C12	11	5	A05A40			A
A05-1A41/1C41	11	A01-1B04/1D04	11	7	A01B04			A
A05-1A42/1C42	11	A04-2A17/2C17	11	6	A05A42			A
A05-1A43/1C43	11	A02-2A22/2C22	11	6	A05A43			A
A05-1B03/1D03	11	A02-1B03/1D03	11	4	A05B03			A
A05-1B03/1D03	22	A07-1B03/1D03	22	4	A05B03			A
A05-1B04/1D04	11	A07-1B04/1D04	11	4	A05B04			A
A05-1B05/1D05	11	A07-1B05/1D05	11	4	A05B05			A
A05-1B08/1D08	11	A02-1B08/1D08	11	4	A05B08			A
A05-1B08/1D08	22	A07-1B08/1D08	22	4	A05B08			A
A05-1B09/1D09	11	A02-1B09/1D09	11	4	A05B09			A
A05-1B09/1D09	22	A07-1B09/1D09	22	4	A05B09			A
A05-1B10/1D10	11	A02-1B10/1D10	11	4	A05B10			A
A05-1B10/1D10	22	A07-1B10/1D10	22	4	A05B10			A
A05-1B11/1D11	11	A02-1B11/1D11	11	4	A05B11			A
A05-1B11/1D11	22	A07-1B11/1D11	22	4	A05B11			A
A05-1B12/1D12	11	A02-1B12/1D12	11	4	A05B12			A
A05-1B12/1D12	22	A07-1B12/1D12	22	4	A05B12			A
A05-1B13/1D13	11	A02-1B13/1D13	11	4	A05B13			A
A05-1B13/1D13	22	A07-1B13/1D13	22	4	A05B13			A
A05-1B14/1D14	11	A02-1B14/1D14	11	4	A05B14			A
A05-1B14/1D14	22	A07-1B14/1D14	22	4	A05B14			A

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PAGE     13  PACK         A05

     ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS  REV

     A05-1B15/1D15  11           A02-1B15/1D15  11      4   A05B15                  A
     A05-1B15/1D15  22           A07-1B15/1D15  22      4   A05B15                  A

     A05-1B16/1D16  11           A02-1B16/1D16  11      4   A05B16                  A
     A05-1B16/1D16  22           A07-1B16/1D16  22      4   A05B16                  A

     A05-1B17/1D17  11           A04-2A33/2C33  11     10   A04A83                  A

     A05-1B22/1D22  11           A04-1A34/1C34  11      4   A04A34                  A

     A05-1B24/1D24  22           A04-1B24/1D24  22      3   A04B24                  A

     A05-1B25/1D25  22           A04-1B25/1D25  22      3   A04B25                  A

     A05-1B26/1D26  22           A04-1B26/1D26  22      3   A04B26                  A

     A05-1B27/1D27  22           A04-1B27/1D27  22      3   A04B27                  A

     A05-1B28/1D28  22           A04-1B28/1D28  22      3   A04B28                  A

     A05-1B29/1D29  22           A04-1B29/1D29  22      3   A04B29                  A

     A05-1B30/1D30  22           A04-1B30/1D30  22      3   A04B30                  A

     A05-1B31/1D31  22           A04-1B31/1D31  22      3   A04B31                  A

     A05-1B32/1D32  11           A16-2B26/2D26  11     11   A05B32                  A

     A05-1B34/1D34  11           A04-2A21/2C21  11      7   A04A71                  A

     A05-1B35/1D35  22           A02-2A41/2C41  22      9   A01B29                  A

     A05-1B36/1D36  11           A02-2B16/2D16  11      7   A02B66                  A

     A05-1B38/1D38  11           A04-1A43/1C43  11      3   A04A43                  A

     A05-1B40/1D40  11           A13-1A34/1C34  11      7   A13A34                  A

     A05-1B41/1D41  11           A04-2A32/2C32  11      7   A05B41                  A

     A05-1B42/1D42  11           A02-1A19/1C19  11      6   A02A19                  A

     A05-1B43/1D43  11           A01-1B03/1D03  11      7   A01B03                  A

     A05-2A03/2C03  11           A02-2A25/2C25  11      5   A05A53                  A

     A05-2A04/2C04  11           A02-2B27/2D27  11      5   A02B77                  A

     A05-2A05/2C05  11           A01-1A29/1C29  11      6   A01A29                  A
     A05-2A05/2C05  22           A02-2B35/2D35  22      6   A01A29                  A

     A05-2A07/2C07  11           A01-1B14/1D14  11      8   A01B14                  A

     A05-2A08/2C08  11           A01-1A14/1C14  11      8   A01A14                  A
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PAGE    14  PACK        A05

     ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS   REV

     A05-2A09/2C09   11          A14-2B16/2D16   11     8    A04B84                   A
     A05-2A09/2C09   22          A04-2B34/2D34   22     5    A04B84                   A

     A05-2A13/2C13   11          A04-2A03/2C03   11     4    A05A63                   A

     A05-2A14/2C14   11          A02-1A21/1C21   11     8    A05A64                   A

     A05-2A15/2C15   11          A02-2A40/2C40   11     6    A05A65                   A

     A05-2A17/2C17   11          A09-2B14/2D14   11     5    A09B64                   A

     A05-2A18/2C18   11          A04-2A27/2C27   11     4    A04A77                   A

     A05-2A19/2C19   11          A04-2B27/2D27   11     3    A04B77                   A

     A05-2A20/2C20   11          A02-2A37/2C37   11     5    A05A70                   A

     A05-2A21/2C21   11          A01-2B13/2D13   11     5    A01B63                   A

     A05-2A22/2C22   11          A13-1A38/1C38   11     9    A13A38                   A

     A05-2A24/2C24   22          A02-2A38/2C38   22     5    A05A74                   A

     A05-2A25/2C25   11          A04-2A20/2C20   11     3    A04A70                   A

     A05-2A26/2C26   11          A02-2A20/2C20   11     4    A02A70                   A

     A05-2A27/2C27   11          A01-2A09/2C09   11     5    A01A59                   A

     A05-2A28/2C28   11          A04-1B33/1D33   11     8    A04B33                   A

     A05-2A30/2C30   11          A04-2A30/2C30   11     3    A05A80                   A
     A05-2A30/2C30   22          A07-2A30/2C30   22     4    A05A80                   A

     A05-2A31/2C31   11          A04-2A31/2C31   11     3    A05A81                   A
     A05-2A31/2C31   22          A07-2A31/2C31   22     4    A05A81                   A

     A05-2A34/2C34   11          A02-2A34/2C34   11     4    A05A84                   A
     A05-2A34/2C34   22          A07-2A34/2C34   22     4    A05A84                   A

     A05-2A35/2C35   11          A04-2A35/2C35   11     3    A05A85                   A
     A05-2A35/2C35   22          A07-2A35/2C35   22     4    A05A85                   A

     A05-2A36/2C36   11          A04-2A36/2C36   11     3    A05A86                   A
     A05-2A36/2C36   22          A07-2A36/2C36   22     4    A05A86                   A

     A05-2A37/2C37   11          A04-2A37/2C37   11     3    A05A87                   A
     A05-2A37/2C37   22          A07-2A37/2C37   22     4    A05A87                   A

     A05-2A38/2C38   11          A04-2A38/2C38   11     3    A05A88                   A
     A05-2A38/2C38   22          A07-2A38/2C38   22     4    A05A88                   A

     A05-2A40/2C40   11          A04-2A40/2C40   11     3    A05A90                   A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A05-2A40/2C40	22	A07-2A40/2C40	22	4	A05A90			A
A05-2A41/2C41	11	A04-2A41/2C41	11	3	A05A91			A
A05-2A41/2C41	22	A07-2A41/2C41	22	4	A05A91			A
A05-2A42/2C42	11	A04-2A42/2C42	11	3	A05A92			A
A05-2A42/2C42	22	A07-2A42/2C42	22	4	A05A92			A
A05-2A43/2C43	11	A04-2A43/2C43	11	3	A05A93			A
A05-2A43/2C43	22	A07-2A43/2C43	22	4	A05A93			A
A05-2B03/2D03	11	A01-1A03/1C03	11	9	A05B53			A
A05-2B04/2D04	11	A02-2B29/2D29	11	6	A02B79			A
A05-2B04/2D04	22	A14-1A40/1C40	22	8	A02B79			A
A05-2B05/2D05	22	A02-2B32/2D32	22	6	A01B30			A
A05-2B07/2D07	11	A02-1A35/1C35	11	6	A05B57			A
A05-2B08/2D08	11	A14-1B35/1D35	11	9	A14B35			A
A05-2B10/2D10	11	A01-2A04/2C04	11	5	A05B60			A
A05-2B12/2D12	11	A04-2B33/2D33	11	5	A04B83			A
A05-2B15/2D15	11	A02-2B28/2D28	11	5	A14B54			A
A05-2B15/2D15	22	A14-2B04/2D04	22	8	A14B54			A
A05-2B16/2D16	11	A01-1B22/1D22	11	8	A05B66			A
A05-2B17/2D17	11	A01-1A19/1C19	11	8	A05B67			A
A05-2B18/2D18	11	A02-2B17/2D17	11	4	A05B68			A
A05-2B22/2D22	11	A04-2A34/2C34	11	4	A05B72			A
A05-2B24/2D24	11	A04-2B26/2D26	11	3	A04B76			A
A05-2B25/2D25	11	A01-2B10/2D10	11	5	A05B75			A
A05-2B29/2D29	11	A04-1A32/1C32	11	8	A05B79			A
A05-2B30/2D30	11	A04-2B30/2D30	11	3	A05B80			A
A05-2B30/2D30	22	A07-2B30/2D30	22	4	A05B80			A
A05-2B31/2D31	11	A04-2B31/2D31	11	3	A05B81			A
A05-2B31/2D31	22	A07-2B31/2D31	22	4	A05B81			A
A05-2B32/2D32	11	A07-2B32/2D32	11	4	A05B82			A
A05-2B33/2D33	11	A02-2B33/2D33	11	4	A05B83			A
A05-2B33/2D33	22	A07-2B33/2D33	22	4	A05B83			A

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PAGE    16  PACK        A05

     ORIGIN         LEVS        DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS  REV

     A05-2B34/2D34   11          A02-2B34/2D34   11      4    A05B84                   A
     A05-2B34/2D34   22          A07-2B34/2D34   22      4    A05B84                   A

     A05-2B35/2D35   11          A04-2B35/2D35   11      3    A05B85                   A
     A05-2B35/2D35   22          A07-2B35/2D35   22      4    A05B85                   A

     A05-2B36/2D36   11          A04-2B36/2D36   11      3    A05B86                   A
     A05-2B36/2D36   22          A07-2B36/2D36   22      4    A05B86                   A

     A05-2B37/2D37   11          A04-2B37/2D37   11      3    A05B87                   A
     A05-2B37/2D37   22          A07-2B37/2D37   22      4    A05B87                   A

     A05-2B38/2D38   11          A04-2B38/2D38   11      3    A05B88                   A
     A05-2B38/2D38   22          A07-2B38/2D38   22      4    A05B88                   A

     A05-2B40/2D40   11          A04-2B40/2D40   11      3    A05B90                   A
     A05-2B40/2D40   22          A07-2B40/2D40   22      4    A05B90                   A

     A05-2B41/2D41   11          A04-2B41/2D41   11      3    A05B91                   A
     A05-2B41/2D41   22          A07-2B41/2D41   22      4    A05B91                   A

     A05-2B42/2D42   11          A04-2B42/2D42   11      3    A05B92                   A
     A05-2B42/2D42   22          A07-2B42/2D42   22      4    A05B92                   A

     A05-2B43/2D43   11          A04-2B43/2D43   11      3    A05B93                   A
     A05-2B43/2D43   22          A07-2B43/2D43   22      4    A05B93                   A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A07-1A03/1C03	11	A09-1A03/1C03	11	4	A05A03			A
A07-1A03/1C03	22	A05-1A03/1C03	22	4	A05A03			A
A07-1A04/1C04	11	A05-1A04/1C04	11	4	A05A04			A
A07-1A04/1C04	22	A09-1A04/1C04	22	4	A05A04			A
A07-1A05/1C05	11	A09-1A05/1C05	11	4	A05A05			A
A07-1A05/1C05	22	A05-1A05/1C05	22	4	A05A05			A
A07-1A07/1C07	11	A09-1A07/1C07	11	4	A05A07			A
A07-1A07/1C07	22	A05-1A07/1C07	22	4	A05A07			A
A07-1A08/1C08	11	A08-1A08/1C08	11	3	A05A08			A
A07-1A08/1C08	22	A05-1A08/1C08	22	4	A05A08			A
A07-1A09/1C09	11	A08-1A09/1C09	11	3	A05A09			A
A07-1A09/1C09	22	A05-1A09/1C09	22	4	A05A09			A
A07-1A10/1C10	11	A08-1A10/1C10	11	3	A05A10			A
A07-1A10/1C10	22	A05-1A10/1C10	22	4	A05A10			A
A07-1A11/1C11	11	A08-1A11/1C11	11	3	A05A11			A
A07-1A11/1C11	22	A05-1A11/1C11	22	4	A05A11			A
A07-1A12/1C12	11	A08-1A12/1C12	11	3	A05A12			A
A07-1A12/1C12	22	A05-1A12/1C12	22	4	A05A12			A
A07-1A13/1C13	11	A08-1A13/1C13	11	3	A05A13			A
A07-1A13/1C13	22	A05-1A13/1C13	22	4	A05A13			A
A07-1A14/1C14	11	A08-1A14/1C14	11	3	A05A14			A
A07-1A14/1C14	22	A05-1A14/1C14	22	4	A05A14			A
A07-1A15/1C15	11	A08-1A15/1C15	11	3	A05A15			A
A07-1A15/1C15	22	A05-1A15/1C15	22	4	A05A15			A
A07-1A16/1C16	11	A08-1A16/1C16	11	3	A05A16			A
A07-1A16/1C16	22	A05-1A16/1C16	22	4	A05A16			A
A07-1A17/1C17	11	A09-2A13/2C13	11	8	A07A17			A
A07-1A18/1C18	11	A08-2B26/2D26	11	9	A08B76			A
A07-1A19/1C19	11	A08-2B25/2D25	11	9	A08B75			A
A07-1B03/1D03	11	A09-1B03/1D03	11	4	A05B03			A
A07-1B03/1D03	22	A05-1B03/1D03	22	4	A05B03			A
A07-1B04/1D04	11	A05-1B04/1D04	11	4	A05B04			A
A07-1B04/1D04	22	A09-1B04/1D04	22	4	A05B04			A
A07-1B05/1D05	11	A05-1B05/1D05	11	4	A05B05			A
A07-1B05/1D05	22	A09-1B05/1D05	22	4	A05B05			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A07-1B08/1D08	11	A08-1B08/1D08	11	3	A05B08			A
A07-1B08/1D08	22	A05-1B08/1D08	22	4	A05B08			A
A07-1B09/1D09	11	A08-1B09/1D09	11	3	A05B09			A
A07-1B09/1D09	22	A05-1B09/1D09	22	4	A05B09			A
A07-1B10/1D10	11	A08-1B10/1D10	11	3	A05B10			A
A07-1B10/1D10	22	A05-1B10/1D10	22	4	A05B10			A
A07-1B11/1D11	11	A08-1B11/1D11	11	3	A05B11			A
A07-1B11/1D11	22	A05-1B11/1D11	22	4	A05B11			A
A07-1B12/1D12	11	A08-1B12/1D12	11	3	A05B12			A
A07-1B12/1D12	22	A05-1B12/1D12	22	4	A05B12			A
A07-1B13/1D13	11	A08-1B13/1D13	11	3	A05B13			A
A07-1B13/1D13	22	A05-1B13/1D13	22	4	A05B13			A
A07-1B14/1D14	11	A08-1B14/1D14	11	3	A05B14			A
A07-1B14/1D14	22	A05-1B14/1D14	22	4	A05B14			A
A07-1B15/1D15	11	A08-1B15/1D15	11	3	A05B15			A
A07-1B15/1D15	22	A05-1B15/1D15	22	4	A05B15			A
A07-1B16/1D16	11	A08-1B16/1D16	11	3	A05B16			A
A07-1B16/1D16	22	A05-1B16/1D16	22	4	A05B16			A
A07-1B17/1D17	11	A09-2B13/2D13	11	8	A09B63			A
A07-1B18/1D18	11	A08-2A26/2C26	11	9	A08A76			A
A07-1B19/1D19	11	A08-2A25/2C25	11	9	A08A75			A
A07-2A14/2C14	11	A09-2A14/2C14	11	4	A07A64			A
A07-2A30/2C30	11	A09-2A30/2C30	11	4	A05A80			A
A07-2A30/2C30	22	A05-2A30/2C30	22	4	A05A80			A
A07-2A31/2C31	11	A09-2A31/2C31	11	4	A05A81			A
A07-2A31/2C31	22	A05-2A31/2C31	22	4	A05A81			A
A07-2A34/2C34	11	A08-2A34/2C34	11	3	A05A84			A
A07-2A34/2C34	22	A05-2A34/2C34	22	4	A05A84			A
A07-2A35/2C35	11	A08-2A35/2C35	11	3	A05A85			A
A07-2A35/2C35	22	A05-2A35/2C35	22	4	A05A85			A
A07-2A36/2C36	11	A08-2A36/2C36	11	3	A05A86			A
A07-2A36/2C36	22	A05-2A36/2C36	22	4	A05A86			A
A07-2A37/2C37	11	A08-2A37/2C37	11	3	A05A87			A
A07-2A37/2C37	22	A05-2A37/2C37	22	4	A05A87			A

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     ORIGIN          LEVS       DESTINATION       LEVS  LTH   SIGNAL   CBL   COLORS   REV

     A07-2A38/2C38    11         A08-2A38/2C38     11     3   A05A88                   A
     A07-2A38/2C38    22         A05-2A38/2C38     22     4   A05A88                   A

     A07-2A40/2C40    11         A08-2A40/2C40     11     3   A05A90                   A
     A07-2A40/2C40    22         A05-2A40/2C40     22     4   A05A90                   A

     A07-2A41/2C41    11         A08-2A41/2C41     11     3   A05A91                   A
     A07-2A41/2C41    22         A05-2A41/2C41     22     4   A05A91                   A

     A07-2A42/2C42    11         A08-2A42/2C42     11     3   A05A92                   A
     A07-2A42/2C42    22         A05-2A42/2C42     22     4   A05A92                   A

     A07-2A43/2C43    11         A08-2A43/2C43     11     3   A05A93                   A
     A07-2A43/2C43    22         A05-2A43/2C43     22     4   A05A93                   A

     A07-2B30/2D30    11         A09-2B30/2D30     11     4   A05B80                   A
     A07-2B30/2D30    22         A05-2B30/2D30     22     4   A05B80                   A

     A07-2B31/2D31    11         A09-2B31/2D31     11     4   A05B81                   A
     A07-2B31/2D31    22         A05-2B31/2D31     22     4   A05B81                   A

     A07-2B32/2D32    11         A05-2B32/2D32     11     4   A05B82                   A
     A07-2B32/2D32    22         A09-2B32/2D32     22     4   A05B82                   A

     A07-2B33/2D33    11         A08-2B33/2D33     11     3   A05B83                   A
     A07-2B33/2D33    22         A05-2B33/2D33     22     4   A05B83                   A

     A07-2B34/2D34    11         A08-2B34/2D34     11     3   A05B84                   A
     A07-2B34/2D34    22         A05-2B34/2D34     22     4   A05B84                   A

     A07-2B35/2D35    11         A08-2B35/2D35     11     3   A05B85                   A
     A07-2B35/2D35    22         A05-2B35/2D35     22     4   A05B85                   A

     A07-2B36/2D36    11         A08-2B36/2D36     11     3   A05B86                   A
     A07-2B36/2D36    22         A05-2B36/2D36     22     4   A05B86                   A

     A07-2B37/2D37    11         A08-2B37/2D37     11     3   A05B87                   A
     A07-2B37/2D37    22         A05-2B37/2D37     22     4   A05B87                   A

     A07-2B38/2D38    11         A08-2B38/2D38     11     3   A05B88                   A
     A07-2B38/2D38    22         A05-2B38/2D38     22     4   A05B88                   A

     A07-2B40/2D40    11         A08-2B40/2D40     11     3   A05B90                   A
     A07-2B40/2D40    22         A05-2B40/2D40     22     4   A05B90                   A

     A07-2B41/2D41    11         A08-2B41/2D41     11     3   A05B91                   A
     A07-2B41/2D41    22         A05-2B41/2D41     22     4   A05B91                   A

     A07-2B42/2D42    11         A08-2B42/2D42     11     3   A05B92                   A
     A07-2B42/2D42    22         A05-2B42/2D42     22     4   A05B92                   A

     A07-2B43/2D43    11         A08-2B43/2D43     11     3   A05B93                   A
     A07-2B43/2D43    22         A05-2B43/2D43     22     4   A05B93                   A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A08-1A07/1C07	11	A09-1B10/1D10	11	3	A09B10			A
A08-1A08/1C08	11	A07-1A08/1C08	11	3	A05A08			A
A08-1A08/1C08	22	A10-1A08/1C08	22	4	A05A08			A
A08-1A09/1C09	11	A07-1A09/1C09	11	3	A05A09			A
A08-1A09/1C09	22	A10-1A09/1C09	22	4	A05A09			A
A08-1A10/1C10	11	A07-1A10/1C10	11	3	A05A10			A
A08-1A10/1C10	22	A10-1A10/1C10	22	4	A05A10			A
A08-1A11/1C11	11	A07-1A11/1C11	11	3	A05A11			A
A08-1A11/1C11	22	A10-1A11/1C11	22	4	A05A11			A
A08-1A12/1C12	11	A07-1A12/1C12	11	3	A05A12			A
A08-1A12/1C12	22	A10-1A12/1C12	22	4	A05A12			A
A08-1A13/1C13	11	A07-1A13/1C13	11	3	A05A13			A
A08-1A13/1C13	22	A10-1A13/1C13	22	4	A05A13			A
A08-1A14/1C14	11	A07-1A14/1C14	11	3	A05A14			A
A08-1A14/1C14	22	A10-1A14/1C14	22	4	A05A14			A
A08-1A15/1C15	11	A07-1A15/1C15	11	3	A05A15			A
A08-1A15/1C15	22	A10-1A15/1C15	22	4	A05A15			A
A08-1A16/1C16	11	A07-1A16/1C16	11	3	A05A16			A
A08-1A16/1C16	22	A10-1A16/1C16	22	4	A05A16			A
A08-1A17/1C17	11	A09-1A17/1C17	11	3	A09A17			A
A08-1A18/1C18	11	A09-1A18/1C18	11	3	A09A18			A
A08-1A19/1C19	11	A09-1A19/1C19	11	3	A09A19			A
A08-1A20/1C20	11	A09-1A20/1C20	11	3	A08A20			A
A08-1A21/1C21	11	A09-1A21/1C21	11	3	A09A21			A
A08-1A22/1C22	11	A09-1A22/1C22	11	3	A09A22			A
A08-1A24/1C24	11	A09-1A24/1C24	11	3	A09A24			A
A08-1A25/1C25	11	A09-1A25/1C25	11	3	A09A25			A
A08-1A26/1C26	11	A09-1A26/1C26	11	3	A09A26			A
A08-1A27/1C27	11	A09-1A27/1C27	11	3	A09A27			A
A08-1A28/1C28	11	A09-1A28/1C28	11	3	A09A28			A
A08-1A29/1C29	11	A09-1A29/1C29	11	3	A09A29			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A08-1A30/1C30	11	A09-1A30/1C30	11	3	A08A30			A
A08-1A31/1C31	11	A09-1A31/1C31	11	3	A08A31			A
A08-1A32/1C32	11	A09-1A32/1C32	11	3	A08A32			A
A08-1A33/1C33	11	A09-1A33/1C33	11	3	A08A33			A
A08-1A34/1C34	11	A09-1A34/1C34	11	3	A08A34			A
A08-1A35/1C35	11	A09-1A35/1C35	11	3	A08A35			A
A08-1A36/1C36	11	A09-1A36/1C36	11	3	A08A36			A
A08-1A37/1C37	11	A09-1A37/1C37	11	3	A08A37			A
A08-1A38/1C38	11	A09-1A38/1C38	11	3	A08A38			A
A08-1A40/1C40	11	A09-1A40/1C40	11	3	A09A40			A
A08-1A41/1C41	11	A09-1A41/1C41	11	3	A09A41			A
A08-1A42/1C42	11	A09-1A42/1C42	11	3	A08A42			A
A08-1A43/1C43	11	A09-1A43/1C43	11	3	A09A43			A
A08-1B08/1D08	11	A07-1B08/1D08	11	3	A05B08			A
A08-1B08/1D08	22	A10-1B08/1D08	22	4	A05B08			A
A08-1B09/1D09	11	A07-1B09/1D09	11	3	A05B09			A
A08-1B09/1D09	22	A10-1B09/1D09	22	4	A05B09			A
A08-1B10/1D10	11	A07-1B10/1D10	11	3	A05B10			A
A08-1B10/1D10	22	A10-1B10/1D10	22	4	A05B10			A
A08-1B11/1D11	11	A07-1B11/1D11	11	3	A05B11			A
A08-1B11/1D11	22	A10-1B11/1D11	22	4	A05B11			A
A08-1B12/1D12	11	A07-1B12/1D12	11	3	A05B12			A
A08-1B12/1D12	22	A10-1B12/1D12	22	4	A05B12			A
A08-1B13/1D13	11	A07-1B13/1D13	11	3	A05B13			A
A08-1B13/1D13	22	A10-1B13/1D13	22	4	A05B13			A
A08-1B14/1D14	11	A07-1B14/1D14	11	3	A05B14			A
A08-1B14/1D14	22	A10-1B14/1D14	22	4	A05B14			A
A08-1B15/1D15	11	A07-1B15/1D15	11	3	A05B15			A
A08-1B15/1D15	22	A10-1B15/1D15	22	4	A05B15			A
A08-1B16/1D16	11	A07-1B16/1D16	11	3	A05B16			A
A08-1B16/1D16	22	A10-1B16/1D16	22	4	A05B16			A
A08-1B17/1D17	11	A09-1B17/1D17	11	3	A09B17			A

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PAGE     22  PACK          A08
     ORIGIN          LEVS        DESTINATION       LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A08-1B18/1D18   11          A09-1B18/1D18    11      3    A09B18                    A
     A08-1B19/1D19   11          A09-1B19/1D19    11      3    A09B19                    A
     A08-1B20/1D20   11          A09-1B20/1D20    11      3    A08B20                    A
     A08-1B21/1D21   11          A09-1B21/1D21    11      3    A08B21                    A
     A08-1B22/1D22   11          A09-1B22/1D22    11      3    A09B22                    A
     A08-1B24/1D24   11          A09-1B24/1D24    11      3    A09B24                    A
     A08-1B25/1D25   11          A09-1B25/1D25    11      3    A09B25                    A
     A08-1B26/1D26   11          A09-1B26/1D26    11      3    A09B26                    A
     A08-1B27/1D27   11          A09-1B27/1D27    11      3    A09B27                    A
     A08-1B28/1D28   11          A09-1B28/1D28    11      3    A09B28                    A
     A08-1B29/1D29   11          A09-1B29/1D29    11      3    A09B29                    A
     A08-1B30/1D30   11          A09-1B30/1D30    11      3    A08B30                    A
     A08-1B31/1D31   11          A09-1B31/1D31    11      3    A08B31                    A
     A08-1B32/1D32   11          A09-1B32/1D32    11      3    A08B32                    A
     A08-1B33/1D33   11          A09-1B33/1D33    11      3    A08B33                    A
     A08-1B34/1D34   11          A09-1B34/1D34    11      3    A08B34                    A
     A08-1B35/1D35   11          A09-1B35/1D35    11      3    A08B35                    A
     A08-1B36/1D36   11          A09-1B36/1D36    11      3    A08B36                    A
     A08-1B37/1D37   11          A09-1B37/1D37    11      3    A08B37                    A
     A08-1B38/1D38   11          A09-1B38/1D38    11      3    A08B38                    A
     A08-1B40/1D40   11          A09-1B40/1D40    11      3    A09B40                    A
     A08-1B41/1D41   11          A09-1B41/1D41    11      3    A09B41                    A
     A08-1B42/1D42   11          A09-1B42/1D42    11      3    A08B42                    A
     A08-1B43/1D43   11          A09-1B43/1D43    11      3    A09B43                    A
     A08-2A03/2C03   11          A09-2A03/2C03    11      3    A09A53                    A
     A08-2A04/2C04   11          A09-2A04/2C04    11      3    A09A54                    A
     A08-2A05/2C05   11          A09-2A05/2C05    11      3    A09A55                    A
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PAGE     23  PACK        A08

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS  REV

     A08-2A07/2C07  11          A09-2A07/2C07   11     3    A09A57                 A

     A08-2A08/2C08  11          A09-2A08/2C08   11     3    A09A58                 A

     A08-2A09/2C09  11          A09-2A09/2C09   11     3    A08A59                 A

     A08-2A10/2C10  11          A09-2A10/2C10   11     3    A09A60                 A

     A08-2A11/2C11  11          A09-2A11/2C11   11     3    A09A61                 A

     A08-2A12/2C12  11          A09-2A12/2C12   11     3    A08A62                 A

     A08-2A13/2C13  11          A08-2B13/2D13   11     3    A14B38               . A

     A08-2A14/2C14  11          A08-2B14/2D14   11     3    A14B38                 A
     A08-2A14/2C14  22          A08-2B13/2D13   22     3    A14B38                 A

     A08-2A15/2C15  11          A08-2B15/2D15   11     3    A14B38                 A
     A08-2A15/2C15  22          A08-2B14/2D14   22     3    A14B38                 A

     A08-2A16/2C16  11          A08-2B16/2D16   11     3    A14B38                 A
     A08-2A16/2C16  22          A08-2B15/2D15   22     3    A14B38                 A

     A08-2A17/2C17  11          A08-2B17/2D17   11     3    A14B38                 A
     A08-2A17/2C17  22          A08-2B16/2D16   22     3    A14B38                 A

     A08-2A18/2C18  11          A08-2B18/2D18   11     3    A14B38                 A
     A08-2A18/2C18  22          A08-2B17/2D17   22     3    A14B38                 A

     A08-2A19/2C19  11          A08-2B19/2D19   11     3    A14B38                 A
     A08-2A19/2C19  22          A08-2B18/2D18   22     3    A14B38                 A

     A08-2A20/2C20  11          A08-2B20/2D20   11     3    A14B38                 A
     A08-2A20/2C20  22          A08-2B19/2D19   22     3    A14B38                 A

     A08-2A21/2C21  11          A09-2A21/2C21   11     3    A09A71                 A

     A08-2A22/2C22  11          A09-2A22/2C22   11     3    A09A72                 A

     A08-2A24/2C24  11          A09-2A24/2C24   11     3    A09A74                 A

     A08-2A25/2C25  11          A07-1B19/1D19   11     9    A08A75                 A

     A08-2A26/2C26  11          A07-1B18/1D18   11     9    A08A76                 A

     A08-2A27/2C27  11          A09-2A27/2C27   11     3    A09A77                 A

     A08-2A28/2C28  11          A09-2A28/2C28   11     3    A09A78                 A

     A08-2A33/2C33  11          A09-1A10/1C10   11    10    A09A10                 A

     A08-2A34/2C34  11          A07-2A34/2C34   11     3    A05A84                 A
     A08-2A34/2C34  22          A10-2A34/2C34   22     4    A05A84                 A
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PAGE     24  PACK          A08

     ORIGIN          LEVS       DESTINATION       LEVS  LTH    SIGNAL  CBL  COLORS  REV

     A08-2A35/2C35   11         A07-2A35/2C35    11      3    A05A85                  A
     A08-2A35/2C35   22         A10-2A35/2C35    22      4    A05A85                  A

     A08-2A36/2C36   11         A07-2A36/2C36    11      3    A05A86                  A
     A08-2A36/2C36   22         A10-2A36/2C36    22      4    A05A86                  A

     A08-2A37/2C37   11         A07-2A37/2C37    11      3    A05A87                  A
     A08-2A37/2C37   22         A10-2A37/2C37    22      4    A05A87                  A

     A08-2A38/2C38   11         A07-2A38/2C38    11      3    A05A88                  A
     A08-2A38/2C38   22         A10-2A38/2C38    22      4    A05A88                  A

     A08-2A40/2C40   11         A07-2A40/2C40    11      3    A05A90                  A
     A08-2A40/2C40   22         A10-2A40/2C40    22      4    A05A90                  A

     A08-2A41/2C41   11         A07-2A41/2C41    11      3    A05A91                  A
     A08-2A41/2C41   22         A10-2A41/2C41    22      4    A05A91                  A

     A08-2A42/2C42   11         A07-2A42/2C42    11      3    A05A92                  A
     A08-2A42/2C42   22         A10-2A42/2C42    22      4    A05A92                  A

     A08-2A43/2C43   11         A07-2A43/2C43    11      3    A05A93                  A
     A08-2A43/2C43   22         A10-2A43/2C43    22      4    A05A93                  A

     A08-2B03/2D03   11         A09-2B03/2D03    11      3    A09B53                  A

     A08-2B04/2D04   11         A09-2B04/2D04    11      3    A09B54                  A

     A08-2B05/2D05   11         A09-2B05/2D05    11      3    A09B55                  A

     A08-2B07/2D07   11         A09-2B07/2D07    11      3    A09B57                  A

     A08-2B08/2D08   11         A09-2B08/2D08    11      3    A09B58                  A

     A08-2B09/2D09   11         A09-2B09/2D09    11      3    A08B59                  A

     A08-2B10/2D10   11         A09-2B10/2D10    11      3    A09B60                  A

     A08-2B11/2D11   11         A09-2B11/2D11    11      3    A09B61                  A

     A08-2B12/2D12   11         A09-2B12/2D12    11      3    A08B62                  A

     A08-2B13/2D13   11         A08-2A13/2C13    11      3    A14B38                  A
     A08-2B13/2D13   22         A08-2A14/2C14    22      3    A14B38                  A

     A08-2B14/2D14   11         A08-2A14/2C14    11      3    A14B38                  A
     A08-2B14/2D14   22         A08-2A15/2C15    22      3    A14B38                  A

     A08-2B15/2D15   11         A08-2A15/2C15    11      3    A14B38                  A
     A08-2B15/2D15   22         A08-2A16/2C16    22      3    A14B38                  A

     A08-2B16/2D16   11         A08-2A16/2C16    11      3    A14B38                  A
     A08-2B16/2D16   22         A08-2A17/2C17    22      3    A14B38                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A08-2B17/2C17	11	A08-2A17/2C17	11	3	A14B38			A
A08-2B17/2C17	22	A08-2A18/2C18	22	3	A14B38			A
A08-2B18/2C18	11	A08-2A18/2C18	11	3	A14B38			A
A08-2B18/2C18	22	A08-2A19/2C19	22	3	A14B38			A
A08-2B19/2C19	11	A08-2A19/2C19	11	3	A14B38			A
A08-2B19/2C19	22	A08-2A20/2C20	22	3	A14B38			A
A08-2B20/2C20	11	A08-2A20/2C20	11	3	A14B38			A
A08-2B20/2C20	22	A14-1B38/1D38	22	8	A14B38			A
A08-2B21/2C21	11	A09-2B21/2D21	11	3	A09B71			A
A08-2B22/2C22	11	A09-2B22/2D22	11	3	A09B72			A
A08-2B24/2C24	11	A09-2B24/2D24	11	3	A08B74			A
A08-2B25/2C25	11	A07-1A19/1C19	11	9	A08B75			A
A08-2B26/2C26	11	A07-1A18/1C18	11	9	A08B76			A
A08-2B27/2C27	11	A09-2B27/2D27	11	3	A09B77			A
A08-2B28/2C28	11	A09-2B28/2D28	11	3	A08B78			A
A08-2B33/2C33	11	A07-2B33/2D33	11	3	A05B83			A
A08-2B33/2C33	22	A10-2B33/2D33	22	4	A05B83			A
A08-2B34/2C34	11	A07-2B34/2D34	11	3	A05B84			A
A08-2B34/2C34	22	A10-2B34/2D34	22	4	A05B84			A
A08-2B35/2C35	11	A07-2B35/2D35	11	3	A05B85			A
A08-2B35/2C35	22	A10-2B35/2D35	22	4	A05B85			A
A08-2B36/2C36	11	A07-2B36/2D36	11	3	A05B86			A
A08-2B36/2C36	22	A10-2B36/2D36	22	4	A05B86			A
A08-2B37/2C37	11	A07-2B37/2D37	11	3	A05B87			A
A08-2B37/2C37	22	A10-2B37/2D37	22	4	A05B87			A
A08-2B38/2C38	11	A07-2B38/2D38	11	3	A05B88			A
A08-2B38/2C38	22	A10-2B38/2D38	22	4	A05B88			A
A08-2B40/2C40	11	A07-2B40/2D40	11	3	A05B90			A
A08-2B40/2C40	22	A10-2B40/2D40	22	4	A05B90			A
A08-2B41/2C41	11	A07-2B41/2D41	11	3	A05B91			A
A08-2B41/2C41	22	A10-2B41/2D41	22	4	A05B91			A
A08-2B42/2C42	11	A07-2B42/2D42	11	3	A05B92			A
A08-2B42/2C42	22	A10-2B42/2D42	22	4	A05B92			A

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PAGE    26  PACK        A08

     ORIGIN        LEVS      DESTINATION      LEVS  LTH    SIGNAL  CBL  COLORS  REV

     A08-2B43/2D43  11         A07-2B43/2D43  11      3    A05B93                 A
     A08-2B43/2D43  22         A10-2B43/2D43  22      4    A05B93                 A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A09-1A03/1C03	11	A07-1A03/1C03	11	4	A05A03			A
A09-1A03/1C03	22	A14-1A03/1C03	22	5	A05A03			A
A09-1A04/1C04	11	A13-1A04/1C04	11	5	A05A04			A
A09-1A04/1C04	22	A07-1A04/1C04	22	4	A05A04			A
A09-1A05/1C05	11	A07-1A05/1C05	11	4	A05A05			A
A09-1A05/1C05	22	A17-1A05/1C05	22	7	A05A05			A
A09-1A07/1C07	11	A07-1A07/1C07	11	4	A05A07			A
A09-1A07/1C07	22	A10-1A07/1C07	22	3	A05A07			A
A09-1A10/1C10	11	A08-2A33/2C33	11	10	A09A10			A
A09-1A17/1C17	11	A08-1A17/1C17	11	3	A09A17			A
A09-1A18/1C18	11	A08-1A18/1C18	11	3	A09A18			A
A09-1A19/1C19	11	A08-1A19/1C19	11	3	A09A19			A
A09-1A20/1C20	11	A08-1A20/1C20	11	3	A08A20			A
A09-1A21/1C21	11	A08-1A21/1C21	11	3	A09A21			A
A09-1A22/1C22	11	A08-1A22/1C22	11	3	A09A22			A
A09-1A24/1C24	11	A08-1A24/1C24	11	3	A09A24			A
A09-1A25/1C25	11	A08-1A25/1C25	11	3	A09A25			A
A09-1A26/1C26	11	A08-1A26/1C26	11	3	A09A26			A
A09-1A27/1C27	11	A08-1A27/1C27	11	3	A09A27			A
A09-1A28/1C28	11	A08-1A28/1C28	11	3	A09A28			A
A09-1A29/1C29	11	A08-1A29/1C29	11	3	A09A29			A
A09-1A30/1C30	11	A08-1A30/1C30	11	3	A08A30			A
A09-1A31/1C31	11	A08-1A31/1C31	11	3	A08A31			A
A09-1A32/1C32	11	A08-1A32/1C32	11	3	A08A32			A
A09-1A33/1C33	11	A08-1A33/1C33	11	3	A08A33			A
A09-1A34/1C34	11	A08-1A34/1C34	11	3	A08A34			A
A09-1A35/1C35	11	A08-1A35/1C35	11	3	A08A35			A
A09-1A36/1C36	11	A08-1A36/1C36	11	3	A08A36			A
A09-1A37/1C37	11	A08-1A37/1C37	11	3	A08A37			A

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PAGE     28  PACK         A09
     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS   REV

     A09-1A38/1C38  11          A08-1A38/1C38  11      3    A08A38                    A

     A09-1A40/1C40  11          A08-1A40/1C40  11      3    A09A40                    A

     A09-1A41/1C41  11          A08-1A41/1C41  11      3    A09A41                    A

     A09-1A42/1C42  11          A08-1A42/1C42  11      3    A08A42                    A

     A09-1A43/1C43  11          A08-1A43/1C43  11      3    A09A43                    A

     A09-1B03/1D03  11          A07-1B03/1D03  11      4    A05B03                    A
     A09-1B03/1D03  22          A13-1B03/1D03  22      5    A05B03                    A

     A09-1B04/1D04  11          A17-1B04/1D04  11      7    A05B04                    A
     A09-1B04/1D04  22          A07-1B04/1D04  22      4    A05B04                    A

     A09-1B05/1D05  11          A13-1B05/1D05  11      5    A05B05                    A
     A09-1B05/1D05  22          A07-1B05/1D05  22      4    A05B05                    A

     A09-1B10/1C10  11          A08-1A07/1C07  11      3    A09B10                    A

     A09-1B17/1C17  11          A08-1B17/1D17  11      3    A09B17                    A

     A09-1B18/1C18  11          A08-1B18/1D18  11      3    A09B18                    A

     A09-1B19/1C19  11          A08-1B19/1D19  11      3    A09B19                    A

     A09-1B20/1C20  11          A08-1B20/1D20  11      3    A08B20                    A

     A09-1B21/1C21  11          A08-1B21/1D21  11      3    A08B21                    A

     A09-1B22/1C22  11          A08-1B22/1D22  11      3    A09B22                    A

     A09-1B24/1C24  11          A08-1B24/1D24  11      3    A09B24                    A

     A09-1B25/1C25  11          A08-1B25/1C25  11      3    A09B25                    A

     A09-1B26/1C26  11          A08-1B26/1D26  11      3    A09B26                    A

     A09-1B27/1C27  11          A08-1B27/1C27  11      3    A09B27                    A

     A09-1B28/1C28  11          A08-1B28/1D28  11      3    A09B28                    A

     A09-1B29/1C29  11          A08-1B29/1D29  11      3    A09B29                    A

     A09-1B30/1C30  11          A08-1B30/1D30  11      3    A08B30                    A

     A09-1B31/1C31  11          A08-1B31/1D31  11      3    A08B31                    A

     A09-1B32/1C32  11          A08-1B32/1D32  11      3    A08B32                    A

     A09-1B33/1C33  11          A08-1B33/1D33  11      3    A08B33                    A
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PAGE    29  PACK        A09
     ORIGIN        LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV

     A09-1B34/1D34  11          A08-1B34/1D34  11      3   A08B34                  A

     A09-1B35/1D35  11          A08-1B35/1D35  11      3   A08B35                  A

     A09-1B36/1D36  11          A08-1B36/1D36  11      3   A08B36                  A

     A09-1B37/1D37  11          A08-1B37/1D37  11      3   A08B37                  A

     A09-1B38/1D38  11          A08-1B38/1D38  11      3   A08B38                  A

     A09-1B40/1D40  11          A08-1B40/1D40  11      3   A09B40                  A

     A09-1B41/1D41  11          A08-1B41/1D41  11      3   A09B41                  A

     A09-1B42/1D42  11          A08-1B42/1D42  11      3   A08B42                  A

     A09-1B43/1D43  11          A08-1B43/1D43  11      3   A09B43                  A

     A09-2A03/2C03  11          A08-2A03/2C03  11      3   A09A53                  A

     A09-2A04/2C04  11          A08-2A04/2C04  11      3   A09A54                  A

     A09-2A05/2C05  11          A08-2A05/2C05  11      3   A09A55                  A

     A09-2A07/2C07  11          A08-2A07/2C07  11      3   A09A57                  A

     A09-2A08/2C08  11          A08-2A08/2C08  11      3   A09A58                  A

     A09-2A09/2C09  11          A08-2A09/2C09  11      3   A08A59                  A

     A09-2A10/2C10  11          A08-2A10/2C10  11      3   A09A60                  A

     A09-2A11/2C11  11          A08-2A11/2C11  11      3   A09A61                  A

     A09-2A12/2C12  11          A08-2A12/2C12  11      3   A08A62                  A

     A09-2A13/2C13  11          A07-1A17/1C17  11      8   A07A17                  A
     A09-2A13/2C13  22          A21-1A36/1C36  22     10   A07A17                  A

     A09-2A14/2C14  11          A07-2A14/2C14  11      4   A07A64                  A

     A09-2A21/2C21  11          A08-2A21/2C21  11      3   A09A71                  A

     A09-2A22/2C22  11          A08-2A22/2C22  11      3   A09A72                  A

     A09-2A24/2C24  11          A08-2A24/2C24  11      3   A09A74                  A

     A09-2A27/2C27  11          A08-2A27/2C27  11      3   A09A77                  A

     A09-2A28/2C28  11          A08-2A28/2C28  11      3   A09A78                  A

     A09-2A30/2C30  11          A07-2A30/2C30  11      4   A05A80                  A

     A09-2A31/2C31  11          A07-2A31/2C31  11      4   A05A81                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A09-2B03/2D03	11	A08-2B03/2D03	11	3	A09B53			A
A09-2B04/2D04	11	A08-2B04/2D04	11	3	A09B54			A
A09-2B05/2D05	11	A08-2B05/2D05	11	3	A09B55			A
A09-2B07/2D07	11	A08-2B07/2D07	11	3	A09B57			A
A09-2B08/2D08	11	A08-2B08/2D08	11	3	A09B58			A
A09-2B09/2D09	11	A08-2B09/2D09	11	3	A08B59			A
A09-2B10/2D10	11	A08-2B10/2D10	11	3	A09B60			A
A09-2B11/2D11	11	A08-2B11/2D11	11	3	A09B61			A
A09-2B12/2D12	11	A08-2B12/2D12	11	3	A08B62			A
A09-2B13/2D13	11	A07-1B17/1D17	11	8	A09B63			A
A09-2B13/2D13	22	A21-1B36/1D36	22	10	A09B63			A
A09-2B14/2D14	11	A05-2A17/2C17	11	5	A09B64			A
A09-2B21/2D21	11	A08-2B21/2D21	11	3	A09B71			A
A09-2B22/2D22	11	A08-2B22/2D22	11	3	A09B72			A
A09-2B24/2D24	11	A08-2B24/2D24	11	3	A08B74			A
A09-2B27/2D27	11	A08-2B27/2D27	11	3	A09B77			A
A09-2B28/2D28	11	A08-2B28/2D28	11	3	A08B78			A
A09-2B30/2D30	11	A07-2B30/2D30	11	4	A05B80			A
A09-2B31/2D31	11	A07-2B31/2D31	11	4	A05B81			A
A09-2B31/2D31	22	A15-2B31/2D31	22	6	A05B81			A
A09-2B32/2D32	22	A07-2B32/2D32	22	4	A05B82			A

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PAGE    31  PACK        A10

     ORIGIN         LEVS       DESTINATION       LEVS  LTH   SIGNAL   CBL   COLORS   REV


     A10-1A07/1C07  11          A13-1A07/1C07  11     4   A05A07                   A
     A10-1A07/1C07  22          A09-1A07/1C07  22     3   A05A07                   A

     A10-1A08/1C08  11          A13-1A08/1C08  11     4   A05A08                   A
     A10-1A08/1C08  22          A08-1A08/1C08  22     4   A05A08                   A

     A10-1A09/1C09  11          A13-1A09/1C09  11     4   A05A09                   A
     A10-1A09/1C09  22          A08-1A09/1C09  22     4   A05A09                   A

     A10-1A10/1C10  11          A13-1A10/1C10  11     4   A05A10                   A
     A10-1A10/1C10  22          A08-1A10/1C10  22     4   A05A10                   A

     A10-1A11/1C11  11          A13-1A11/1C11  11     4   A05A11                   A
     A10-1A11/1C11  22          A08-1A11/1C11  22     4   A05A11                   A

     A10-1A12/1C12  11          A13-1A12/1C12  11     4   A05A12                   A
     A10-1A12/1C12  22          A08-1A12/1C12  22     4   A05A12                   A

     A10-1A13/1C13  11          A13-1A13/1C13  11     4   A05A13                   A
     A10-1A13/1C13  22          A08-1A13/1C13  22     4   A05A13                   A

     A10-1A14/1C14  11          A13-1A14/1C14  11     4   A05A14                   A
     A10-1A14/1C14  22          A08-1A14/1C14  22     4   A05A14                   A

     A10-1A15/1C15  11          A13-1A15/1C15  11     4   A05A15                   A
     A10-1A15/1C15  22          A08-1A15/1C15  22     4   A05A15                   A

     A10-1A16/1C16  11          A13-1A16/1C16  11     4   A05A16                   A
     A10-1A16/1C16  22          A08-1A16/1C16  22     4   A05A16                   A

     A10-1B08/1D08  11          A13-1B08/1D08  11     4   A05B08                   A
     A10-1B08/1D08  22          A08-1B08/1D08  22     4   A05B08                   A

     A10-1B09/1D09  11          A13-1B09/1D09  11     4   A05B09                   A
     A10-1B09/1D09  22          A08-1B09/1D09  22     4   A05B09                   A

     A10-1B10/1D10  11          A13-1B10/1D10  11     4   A05B10                   A
     A10-1B10/1D10  22          A08-1B10/1D10  22     4   A05B10                   A

     A10-1B11/1D11  11          A13-1B11/1D11  11     4   A05B11                   A
     A10-1B11/1D11  22          A08-1B11/1D11  22     4   A05B11                   A

     A10-1B12/1D12  11          A13-1B12/1D12  11     4   A05B12                   A
     A10-1B12/1D12  22          A08-1B12/1D12  22     4   A05B12                   A

     A10-1B13/1D13  11          A13-1B13/1D13  11     4   A05B13                   A
     A10-1B13/1D13  22          A08-1B13/1D13  22     4   A05B13                   A

     A10-1B14/1D14  11          A13-1B14/1D14  11     4   A05B14                   A
     A10-1B14/1D14  22          A08-1B14/1D14  22     4   A05B14                   A

     A10-1B15/1D15  11          A13-1B15/1D15  11     4   A05B15                   A
     A10-1B15/1D15  22          A08-1B15/1D15  22     4   A05B15                   A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A10-1B16/1D16	11	A13-1B16/1D16	11	4	A05B16			A
A10-1B16/1D16	22	A08-1B16/1D16	22	4	A05B16			A
A10-2A34/2C34	11	A13-1A35/1C35	11	8	A05A84			A
A10-2A34/2C34	22	A08-2A34/2C34	22	4	A05A84			A
A10-2A35/2C35	11	A14-2A35/2C35	11	5	A05A85			A
A10-2A35/2C35	22	A08-2A35/2C35	22	4	A05A85			A
A10-2A36/2C36	11	A14-2A36/2C36	11	5	A05A86			A
A10-2A36/2C36	22	A08-2A36/2C36	22	4	A05A86			A
A10-2A37/2C37	11	A14-2A37/2C37	11	5	A05A87			A
A10-2A37/2C37	22	A08-2A37/2C37	22	4	A05A87			A
A10-2A38/2C38	11	A14-2A38/2C38	11	5	A05A88			A
A10-2A38/2C38	22	A08-2A38/2C38	22	4	A05A88			A
A10-2A40/2C40	11	A14-2A40/2C40	11	5	A05A90			A
A10-2A40/2C40	22	A08-2A40/2C40	22	4	A05A90			A
A10-2A41/2C41	11	A14-2A41/2C41	11	5	A05A91			A
A10-2A41/2C41	22	A08-2A41/2C41	22	4	A05A91			A
A10-2A42/2C42	11	A14-2A42/2C42	11	5	A05A92			A
A10-2A42/2C42	22	A08-2A42/2C42	22	4	A05A92			A
A10-2A43/2C43	11	A14-2A43/2C43	11	5	A05A93			A
A10-2A43/2C43	22	A08-2A43/2C43	22	4	A05A93			A
A10-2B33/2D33	11	A13-1B34/1D34	11	8	A05B83			A
A10-2B33/2D33	22	A08-2B33/2D33	22	4	A05B83			A
A10-2B34/2D34	11	A17-2B34/2D34	11	7	A05B84			A
A10-2B34/2D34	22	A08-2B34/2D34	22	4	A05B84			A
A10-2B35/2D35	11	A14-2B35/2D35	11	5	A05B85			A
A10-2B35/2D35	22	A08-2B35/2D35	22	4	A05B85			A
A10-2B36/2D36	11	A14-2B36/2D36	11	5	A05B86			A
A10-2B36/2D36	22	A08-2B36/2D36	22	4	A05B86			A
A10-2B37/2D37	11	A14-2B37/2D37	11	5	A05B87			A
A10-2B37/2D37	22	A08-2B37/2D37	22	4	A05B87			A
A10-2B38/2D38	11	A14-2B38/2D38	11	5	A05B88			A
A10-2B38/2D38	22	A08-2B38/2D38	22	4	A05B88			A
A10-2B40/2D40	11	A14-2B40/2D40	11	5	A05B90			A
A10-2B40/2D40	22	A08-2B40/2D40	22	4	A05B90			A
A10-2B41/2D41	11	A14-2B41/2D41	11	5	A05B91			A
A10-2B41/2D41	22	A08-2B41/2D41	22	4	A05B91			A

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PAGE     33  PACK         A10

     ORIGIN          LEVS       DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A10-2B42/2D42  11          A14-2B42/2D42  11      5   A05B92                  A
     A10-2B42/2D42  22          A08-2B42/2D42  22      4   A05B92                  A

     A10-2B43/2D43  11          A14-2B43/2D43  11      5   A05B93                  A
     A10-2B43/2D43  22          A08-2B43/2D43  22      4   A05B93                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A13-1A03/1C03	11	A14-2A31/2C31	11	11	A14A81			A
A13-1A04/1C04	11	A09-1A04/1C04	11	5	A05A04			A
A13-1A04/1C04	22	A14-1A04/1C04	22	3	A05A04			A
A13-1A05/1C05	11	A14-2B32/2D32	11	11	A14B82			A
A13-1A07/1C07	11	A10-1A07/1C07	11	4	A05A07			A
A13-1A07/1C07	22	A16-1A07/1C07	22	4	A05A07			A
A13-1A08/1C08	11	A10-1A08/1C08	11	4	A05A08			A
A13-1A08/1C08	22	A17-1A08/1C08	22	5	A05A08			A
A13-1A09/1C09	11	A10-1A09/1C09	11	4	A05A09			A
A13-1A09/1C09	22	A17-1A09/1C09	22	5	A05A09			A
A13-1A10/1C10	11	A10-1A10/1C10	11	4	A05A10			A
A13-1A10/1C10	22	A17-1A10/1C10	22	5	A05A10			A
A13-1A11/1C11	11	A10-1A11/1C11	11	4	A05A11			A
A13-1A11/1C11	22	A17-1A11/1C11	22	5	A05A11			A
A13-1A12/1C12	11	A10-1A12/1C12	11	4	A05A12			A
A13-1A12/1C12	22	A18-1A08/1C08	22	6	A05A12			A
A13-1A13/1C13	11	A10-1A13/1C13	11	4	A05A13			A
A13-1A13/1C13	22	A18-1A09/1C09	22	6	A05A13			A
A13-1A14/1C14	11	A10-1A14/1C14	11	4	A05A14			A
A13-1A14/1C14	22	A18-1A10/1C10	22	6	A05A14			A
A13-1A15/1C15	11	A10-1A15/1C15	11	4	A05A15			A
A13-1A15/1C15	22	A18-1A11/1C11	22	6	A05A15			A
A13-1A16/1C16	11	A10-1A16/1C16	11	4	A05A16			A
A13-1A16/1C16	22	A17-1A16/1C16	22	5	A05A16			A
A13-1A17/1C17	11	A14-2A28/2C28	11	9	A14A78			A
A13-1A18/1C18	11	A14-2A27/2C27	11	9	A14A77			A
A13-1A19/1C19	11	A14-2A30/2C30	11	9	A14A80			A
A13-1A20/1C20	11	A14-2B30/2D30	11	9	A14B80			A
A13-1A22/1C22	11	A19-1A09/1C09	11	6	A13A22			A
A13-1A24/1C24	11	A19-1A28/1C28	11	6	A13A24			A
A13-1A25/1C25	11	A19-1A29/1C29	11	6	A13A25			A
A13-1A26/1C26	11	A19-1A31/1C31	11	6	A13A26			A

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PAGE    35  PACK        A13

     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL   COLORS  REV

     A13-1A27/1C27  11          A19-1A32/1C32  11      6   A13A27                  A

     A13-1A28/1C28  11          A19-1A33/1C33  11      6   A13A28                  A

     A13-1A29/1C29  11          A14-2B25/2D25  11      8   A14B75                  A

     A13-1A30/1C30  11          A14-2B26/2D26  11      8   A14B76                  A

     A13-1A31/1C31  11          A14-2B27/2D27  11      8   A14B77                  A

     A13-1A34/1C34  11          A05-1B40/1D40  11      7   A13A34                  A

     A13-1A35/1C35  11          A10-2A34/2C34  11      8   A05A84                  A
     A13-1A35/1C35  22          A14-2A34/2C34  22      8   A05A84                  A

     A13-1A37/1C37  11          A15-2A26/2C26  11      7   A15A76                  A

     A13-1A38/1C38  11          A05-2A22/2C22  11      9   A13A38                  A

     A13-1A40/1C40  11          A16-2B25/2D25  11      7   A13A40                  A

     A13-1B03/1D03  11          A14-1B03/1D03  11      3   A05B03                  A
     A13-1B03/1D03  22          A09-1B03/1D03  22      5   A05B03                  A

     A13-1B04/1D04  11          A14-2B31/2D31  11     11   A14B81                  A

     A13-1B05/1D05  11          A09-1B05/1D05  11      5   A05B05                  A
     A13-1B05/1D05  22          A14-1B05/1D05  22      3   A05B05                  A

     A13-1B07/1D07  11          A14-2B33/2D33  11     11   A14B83                  A

     A13-1B08/1D08  11          A10-1B08/1D08  11      4   A05B08                  A
     A13-1B08/1D08  22          A17-1B08/1D08  22      5   A05B08                  A

     A13-1B09/1D09  11          A10-1B09/1D09  11      4   A05B09                  A
     A13-1B09/1D09  22          A17-1B09/1D09  22      5   A05B09                  A

     A13-1B10/1D10  11          A10-1B10/1D10  11      4   A05B10                  A
     A13-1B10/1D10  22          A17-1B10/1D10  22      5   A05B10                  A

     A13-1B11/1D11  11          A10-1B11/1D11  11      4   A05B11                  A
     A13-1B11/1D11  22          A17-1B11/1D11  22      5   A05B11                  A

     A13-1B12/1D12  11          A10-1B12/1D12  11      4   A05B12                  A
     A13-1B12/1D12  22          A18-1B08/1D08  22      6   A05B12                  A

     A13-1B13/1D13  11          A10-1B13/1D13  11      4   A05B13                  A
     A13-1B13/1D13  22          A18-1B09/1D09  22      6   A05B13                  A

     A13-1B14/1D14  11          A10-1B14/1D14  11      4   A05B14                  A
     A13-1B14/1D14  22          A18-1B10/1D10  22      6   A05B14                  A

     A13-1B15/1D15  11          A10-1B15/1D15  11      4   A05B15                  A
     A13-1B15/1D15  22          A18-1B11/1D11  22      6   A05B15                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A13-1B16/1C16	11	A10-1B16/1D16	11	4	A05B16			A
A13-1B16/1C16	22	A18-1A16/1C16	22	5	A05B16			A
A13-1B17/1C17	11	A14-2B28/2C28	11	9	A14B78			A
A13-1B18/1C18	11	A14-2B29/2D29	11	9	A14B79			A
A13-1B19/1C19	11	A14-2A29/2C29	11	9	A14A79			A
A13-1B20/1C20	11	A14-1A43/1C43	11	5	A14A43			A
A13-1B21/1C21	11	A16-1B24/1D24	11	4	A18A88			A
A13-1B22/1C22	11	A15-2A34/2C34	11	9	A18A13			A
A13-1B24/1C24	11	A16-1B21/1D21	11	4	A13B24			A
A13-1B25/1C25	11	A16-1B22/1D22	11	4	A13B25			A
A13-1B26/1C26	11	A19-1A16/1C16	11	6	A13B26			A
A13-1B27/1C27	11	A19-1A17/1C17	11	6	A13B27			A
A13-1B28/1C28	11	A19-1A18/1C18	11	6	A13B28			A
A13-1B29/1C29	11	A14-2A26/2C26	11	8	A14A76			A
A13-1B30/1D30	11	A19-1A34/1C34	11	6	A13B30			A
A13-1B31/1C31	11	A04-2B25/2D25	11	10	A04B75			A
A13-1B33/1C33	11	A16-2B34/2D34	11	8	A13B33			A
A13-1B34/1C34	11	A10-2B33/2D33	11	8	A05B83			A
A13-1B34/1D34	22	A17-2B33/2D33	22	8	A05B83			A
A13-1B37/1D37	11	A21-2A18/2C18	11	8	A13B37			A
A13-1B38/1C38	11	A17-1B12/1D12	11	6	A13B38			A
A13-2A15/2C15	11	A14-1A32/1C32	11	6	A14A32			A
A13-2B15/2C15	11	A14-2B15/2D15	11	3	A14B65			A

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PAGE     37  PACK         A14

     ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV


     A14-1A03/1C03  11         A17-1A03/1C03    11      4    A05A03                    A
     A14-1A03/1C03  22         A09-1A03/1C03    22      5    A05A03                    A

     A14-1A04/1C04  11         A16-1A04/1C04    11      4    A05A04                    A
     A14-1A04/1C04  22         A13-1A04/1C04    22      3    A05A04                    A

     A14-1A05/1C05  11         A16-1A27/1C27    11      5    A14A05                    A

     A14-1A17/1C17  11         A19-1B21/1D21    11      6    A14A17                    A

     A14-1A21/1C21  11         A15-1B33/1D33    11      4    A15B33                    A

     A14-1A22/1C22  11         A16-2A22/2C22    11      8    A17A64                    A

     A14-1A24/1C24  11         A15-1A24/1C24    11      3    A15A24                    A

     A14-1A25/1C25  11         A15-1A25/1C25    11      3    A15A25                    A

     A14-1A26/1C26  11         A15-1A26/1C26    11      3    A15A26                    A

     A14-1A27/1C27  11         A15-1A27/1C27    11      3    A15A27                    A

     A14-1A28/1C28  11         A15-1A28/1C28    11      3    A15A28                    A

     A14-1A29/1C29  11         A15-1A29/1C29    11      3    A15A29                    A

     A14-1A30/1C30  11         A15-1A30/1C30    11      3    A15A30                    A

     A14-1A31/1C31  11         A15-1A31/1C31    11      3    A15A31                    A

     A14-1A32/1C32  11         A13-2A15/2C15    11      6    A14A32                    A

     A14-1A33/1C33  11         A15-1B37/1D37    11      3    A15B37                    A
     A14-1A33/1C33  22         A17-2B16/2D16    22      7    A15B37                    A

     A14-1A34/1C34  11         A19-1B30/1D30    11      6    A14A34                    A

     A14-1A35/1C35  11         A17-2B32/2D32    11      8    A14A35                    A

     A14-1A36/1C36  11         A15-1A41/1C41    11      3    A15A41                    A
     A14-1A36/1C36  22         A17-2B17/2D17    22      7    A15A41                    A

     A14-1A37/1C37  11         A15-1A42/1C42    11      3    A15A42                    A
     A14-1A37/1C37  22         A17-2B18/2D18    22      7    A15A42                    A

     A14-1A38/1C38  11         A17-2A18/2C18    11      7    A14A38                    A

     A14-1A40/1C40  11         A16-2B24/2D24    11      7    A02B79                    A
     A14-1A40/1C40  22         A05-2B04/2D04    22      8    A02B79                    A

     A14-1A42/1C42  11         A15-1B42/1D42    11      3    A15B42                    A

     A14-1A43/1C43  11         A13-1B20/1D20    11      5    A14A43                    A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A14-1BC3/1D03	11	A13-1BC3/1D03	11	3	A05B03			A
A14-1BC3/1D03	22	A16-1B03/1D03	22	4	A05B03			A
A14-1BC4/1D04	11	A16-1B35/1D35	11	6	A16B35			A
A14-1BC5/1DC5	11	A16-1BC5/1D05	11	4	A05BC5			A
A14-1BC5/1D05	22	A13-1B05/1D05	22	3	A05B05			A
A14-1BC7/1D07	11	A15-2B25/2D25	11	10	A15B75			A
A14-1BC8/1DC8	11	A16-2AC7/2C07	11	8	A14BC8			A
A14-1B17/1D17	11	A17-1A42/1C42	11	5	A14B17			A
A14-1B21/1D21	11	A16-1A42/1C42	11	5	A16A42			A
A14-1B24/1D24	11	A15-1B24/1D24	11	3	A15B24			A
A14-1B25/1D25	11	A15-1B25/1D25	11	3	A15B25			A
A14-1B26/1D26	11	A15-1B26/1D26	11	3	A15B26			A
A14-1B27/1D27	11	A15-1B27/1D27	11	3	A15B27			A
A14-1B28/1D28	11	A15-1B28/1D28	11	3	A15B28			A
A14-1B29/1D29	11	A15-1B29/1D29	11	3	A15B29			A
A14-1B30/1D30	11	A15-1B30/1D30	11	3	A15B30			A
A14-1B31/1D31	11	A15-1B31/1D31	11	3	A15B31			A
A14-1B33/1D33	11	A17-1A13/1C13	11	5	A17A13			A
A14-1B34/1D34	11	A19-1B33/1D33	11	6	A14B34			A
A14-1B35/1D35	11	AC5-2BC8/2D08	11	9	A14B35			A
A14-1B36/1D36	11	A15-1B41/1D41	11	3	A15B41			A
A14-1B36/1D36	22	A17-2A17/2C17	22	7	A15B41			A
A14-1B37/1D37	11	AC2-2B19/2D19	11	11	A14B37			A
A14-1B38/1D38	22	AC8-2B20/2D20	22	8	A14B38			A
A14-1B40/1D40	11	A16-2A41/2C41	11	8	A14B40			A
A14-1B41/1D41	11	A15-1A38/1C38	11	3	A15A38			A
A14-1B42/1D42	11	A15-2B05/2D05	11	4	A15B55			A
A14-1B43/1D43	11	A15-1A34/1C34	11	3	A15A34			A

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PAGE     39  PACK        A14

     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV (

     A14-2A03/2C03   11          A19-2A41/2C41   11     7   A14A53                  A

     A14-2A04/2C04   11          A19-2B33/2D33   11     7   A14A54                  A

     A14-2A05/2C05   11          A16-2A25/2C25   11     5   A14A55                  A

     A14-2A07/2C07   11          A15-2A07/2C07   11     3   A15A57                  A

     A14-2A08/2C08   11          A15-2A08/2C08   11     3   A15A58                  A

     A14-2A09/2C09   11          A15-2A09/2C09   11     3   A15A59                  A

     A14-2A10/2C10   11          A15-2A10/2C10   11     3   A15A60                  A

     A14-2A11/2C11   11          A15-2A11/2C11   11     3   A15A61                  A

     A14-2A12/2C12   11          A15-2A12/2C12   11     3   A15A62                  A

     A14-2A13/2C13   11          A15-2A13/2C13   11     3   A15A63                  A

     A14-2A14/2C14   11          A15-2A14/2C14   11     3   A15A64                  A

     A14-2A16/2C16   11          A16-1A22/1C22   11     8   A16A22                  A

     A14-2A17/2C17   11          A02-1B36/1D36   11    10   A02B36                  A

     A14-2A26/2C26   11          A13-1B29/1D29   11     8   A14A76                  A

     A14-2A27/2C27   11          A13-1A18/1C18   11     9   A14A77                  A

     A14-2A28/2C28   11          A13-1A17/1C17   11     9   A14A78                  A

     A14-2A29/2C29   11          A13-1B19/1D19   11     9   A14A79                  A

     A14-2A30/2C30   11          A13-1A19/1C19   11     9   A14A80                  A

     A14-2A31/2C31   11          A13-1A03/1C03   11    11   A14A81                  A

     A14-2A32/2C32   11          A02-1A20/1C20   11    12   A14A82                  A

     A14-2A33/2C33   11          A16-2B41/2D41   11     4   A14A83                  A

     A14-2A34/2C34   11          A17-2A34/2C34   11     4   A05A84                  A
     A14-2A34/2C34   22          A13-1A35/1C35   22     8   A05A84                  A

     A14-2A35/2C35   11          A10-2A35/2C35   11     5   A05A85                  A
     A14-2A35/2C35   22          A15-2A35/2C35   22     3   A05A85                  A

     A14-2A36/2C36   11          A10-2A36/2C36   11     5   A05A86                  A
     A14-2A36/2C36   22          A15-2A36/2C36   22     3   A05A86                  A

     A14-2A37/2C37   11          A10-2A37/2C37   11     5   A05A87                  A
     A14-2A37/2C37   22          A15-2A37/2C37   22     3   A05A87                  A
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PAGE    40  PACK        A14

     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV  (

     A14-2A38/2C38   11        A10-2A38/2C38    11     5    A05A88                  A
     A14-2A38/2C38   22        A15-2A38/2C38    22     3    A05A88                  A

     A14-2A40/2C40   11        A10-2A40/2C40    11     5    A05A90                  A
     A14-2A40/2C40   22        A15-2A40/2C40    22     3    A05A90                  A

     A14-2A41/2C41   11        A10-2A41/2C41    11     5    A05A91                  A
     A14-2A41/2C41   22        A15-2A41/2C41    22     3    A05A91                  A

     A14-2A42/2C42   11        A10-2A42/2C42    11     5    A05A92                  A
     A14-2A42/2C42   22        A15-2A42/2C42    22     3    A05A92                  A

     A14-2A43/2C43   11        A10-2A43/2C43    11     5    A05A93                  A
     A14-2A43/2C43   22        A15-2A43/2C43    22     3    A05A93                  A

     A14-2B03/2D03   11        A19-2B43/2D43    11     7    A14B53                  A

     A14-2B04/2D04   22        A05-2B15/2D15    22     8    A14B54                  A

     A14-2B07/2D07   11        A15-2B07/2D07    11     3    A15B57                  A

     A14-2B08/2D08   11        A15-2B08/2D08    11     3    A15B58                  A

     A14-2B09/2D09   11        A15-2B09/2D09    11     3    A15B59                  A

     A14-2B10/2D10   11        A15-2B10/2D10    11     3    A15B60                  A

     A14-2B11/2D11   11        A15-2B11/2D11    11     3    A15B61                  A

     A14-2B12/2D12   11        A15-2B12/2D12    11     3    A15B62                  A

     A14-2B13/2D13   11        A15-2B13/2D13    11     3    A15B63                  A

     A14-2B14/2D14   11        A15-2B14/2D14    11     3    A15B64                  A

     A14-2B15/2D15   11        A13-2B15/2D15    11     3    A14B65                  A

     A14-2B16/2D16   11        A05-2A09/2C09    11     8    A04B84                  A

     A14-2B25/2D25   11        A13-1A29/1C29    11     8    A14B75                  A

     A14-2B26/2D26   11        A13-1A30/1C30    11     8    A14B76                  A

     A14-2B27/2D27   11        A13-1A31/1C31    11     8    A14B77                  A

     A14-2B28/2D28   11        A13-1B17/1D17    11     9    A14B78                  A

     A14-2B29/2D29   11        A13-1B18/1D18    11     9    A14B79                  A

     A14-2B30/2D30   11        A13-1A20/1C20    11     9    A14B80                  A

     A14-2B31/2D31   11        A13-1B04/1D04    11    11    A14B81                  A

     A14-2B32/2D32   11        A13-1A05/1C05    11    11    A14B82                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A14-2B33/2D33	11	A13-1B07/1D07	11	11	A14B83			A
A14-2B34/2D34	11	A17-1A12/1C12	11	10	A14B84			A
A14-2B35/2D35	11	A10-2B35/2D35	11	5	A05B85			A
A14-2B35/2D35	22	A15-2B35/2D35	22	3	A05B85			A
A14-2B36/2D36	11	A10-2B36/2D36	11	5	A05B86			A
A14-2B36/2D36	22	A15-2B36/2D36	22	3	A05B86			A
A14-2B37/2D37	11	A10-2B37/2D37	11	5	A05B87			A
A14-2B37/2D37	22	A15-2B37/2D37	22	3	A05B87			A
A14-2B38/2D38	11	A10-2B38/2D38	11	5	A05B88			A
A14-2B38/2D38	22	A15-2B38/2D38	22	3	A05B88			A
A14-2B40/2D40	11	A10-2B40/2D40	11	5	A05B90			A
A14-2B40/2D40	22	A15-2B40/2D40	22	3	A05B90			A
A14-2B41/2D41	11	A10-2B41/2D41	11	5	A05B91			A
A14-2B41/2D41	22	A15-2B41/2D41	22	3	A05B91			A
A14-2B42/2D42	11	A10-2B42/2D42	11	5	A05B92			A
A14-2B42/2D42	22	A15-2B42/2D42	22	3	A05B92			A
A14-2B43/2D43	11	A10-2B43/2D43	11	5	A05B93			A
A14-2B43/2D43	22	A15-2B43/2D43	22	3	A05B93			A

ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A15-1A12/1C12	11	A17-1B18/1D18	11	4	A17B18			A
A15-1A13/1C13	11	A15-1B34/1D34	11	5	A15B34			A
A15-1A24/1C24	11	A14-1A24/1C24	11	3	A15A24			A
A15-1A24/1C24	22	A17-1A24/1C24	22	4	A15A24			A
A15-1A25/1C25	11	A14-1A25/1C25	11	3	A15A25			A
A15-1A25/1C25	22	A17-1A25/1C25	22	4	A15A25			A
A15-1A26/1C26	11	A14-1A26/1C26	11	3	A15A26			A
A15-1A26/1C26	22	A17-1A26/1C26	22	4	A15A26			A
A15-1A27/1C27	11	A14-1A27/1C27	11	3	A15A27			A
A15-1A27/1C27	22	A17-1A27/1C27	22	4	A15A27			A
A15-1A28/1C28	11	A14-1A28/1C28	11	3	A15A28			A
A15-1A28/1C28	22	A18-1A24/1C24	22	4	A15A28			A
A15-1A29/1C29	11	A14-1A29/1C29	11	3	A15A29			A
A15-1A29/1C29	22	A18-1A25/1C25	22	4	A15A29			A
A15-1A30/1C30	11	A14-1A30/1C30	11	3	A15A30			A
A15-1A30/1C30	22	A18-1A26/1C26	22	4	A15A30			A
A15-1A31/1C31	11	A14-1A31/1C31	11	3	A15A31			A
A15-1A31/1C31	22	A18-1A27/1C27	22	4	A15A31			A
A15-1A32/1C32	11	A17-1A07/1C07	11	5	A17A07			A
A15-1A34/1C34	11	A14-1B43/1D43	11	3	A15A34			A
A15-1A35/1C35	11	A19-1A22/1C22	11	5	A15A35			A
A15-1A38/1C38	11	A14-1B41/1D41	11	3	A15A38			A
A15-1A40/1C40	11	A17-1B41/1D41	11	4	A15A40			A
A15-1A41/1C41	11	A14-1A36/1C36	11	3	A15A41			A
A15-1A42/1C42	11	A14-1A37/1C37	11	3	A15A42			A
A15-1A43/1C43	11	A16-2B40/2D40	11	8	A15A43			A
A15-1B03/1D03	11	A15-2B27/2D27	11	10	A15B77			A
A15-1B24/1D24	11	A14-1B24/1D24	11	3	A15B24			A
A15-1B24/1D24	22	A17-1B24/1D24	22	4	A15B24			A
A15-1B25/1D25	11	A14-1B25/1D25	11	3	A15B25			A
A15-1B25/1D25	22	A17-1B25/1D25	22	4	A15B25			A
A15-1B26/1D26	11	A14-1B26/1D26	11	3	A15B26			A

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     ORIGIN          LEVS       DESTINATION       LEVS   LTH     SIGNAL    CBL   COLORS   REV

     A15-1B26/1D26   22          A17-1B26/1D26   22      4      A15B26                       A

     A15-1B27/1D27   11          A14-1B27/1D27   11      3      A15B27                       A
     A15-1B27/1D27   22          A17-1B27/1D27   22      4      A15B27                       A

     A15-1B28/1D28   11          A14-1B28/1D28   11      3      A15B28                       A
     A15-1B28/1D28   22          A18-1B24/1D24   22      4      A15B28                       A

     A15-1B29/1D29   11          A14-1B29/1D29   11      3      A15B29                       A
     A15-1B29/1D29   22          A18-1B25/1D25   22      4      A15B29                       A

     A15-1B30/1D30   11          A14-1B30/1D30   11      3      A15B30                       A
     A15-1B30/1D30   22          A18-1B26/1D26   22      4      A15B30                       A

     A15-1B31/1D31   11          A14-1B31/1D31   11      3      A15B31                       A
     A15-1B31/1D31   22          A18-1B27/1D27   22      4      A15B31                       A

     A15-1B33/1D33   11          A14-1A21/1C21   11      4      A15B33                       A

     A15-1B34/1D34   11          A15-1A13/1C13   11      5      A15B34                       A

     A15-1B35/1D35   11          A17-1A35/1C35   11      3      A15B35                       A

     A15-1B37/1D37   11          A14-1A33/1C33   11      3      A15B37                       A

     A15-1B38/1D38   11          A18-1B41/1D41   11      4      A15B38                       A

     A15-1B41/1D41   11          A14-1B36/1D36   11      3      A15B41                       A

     A15-1B42/1D42   11          A14-1A42/1C42   11      3      A15B42                       A
     A15-1B42/1D42   22          A16-2A40/2C40   22      8      A15B42                       A

     A15-2A03/2C03   11          A17-1A21/1C21   11      6      A17A21                       A

     A15-2A05/2C05   11          A16-2B08/2D08   11      3      A15A55                       A

     A15-2A07/2C07   11          A14-2A07/2C07   11      3      A15A57                       A
     A15-2A07/2C07   22          A17-2A07/2C07   22      4      A15A57                       A

     A15-2A08/2C08   11          A14-2A08/2C08   11      3      A15A58                       A
     A15-2A08/2C08   22          A17-2A08/2C08   22      4      A15A58                       A

     A15-2A09/2C09   11          A14-2A09/2C09   11      3      A15A59                       A
     A15-2A09/2C09   22          A17-2A09/2C09   22      4      A15A59                       A

     A15-2A10/2C10   11          A14-2A10/2C10   11      3      A15A60                       A
     A15-2A10/2C10   22          A17-2A10/2C10   22      4      A15A60                       A

     A15-2A11/2C11   11          A14-2A11/2C11   11      3      A15A61                       A
     A15-2A11/2C11   22          A18-2A07/2C07   22      4      A15A61                       A

     A15-2A12/2C12   11          A14-2A12/2C12   11      3      A15A62                       A
     A15-2A12/2C12   22          A18-2A08/2C08   22      4      A15A62                       A
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PAGE    44  PACK        A15

      ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

      A15-2A13/2C13    11          A14-2A13/2C13   11     3    A15A63                   A
      A15-2A13/2C13    22          A18-2A09/2C09   22     4    A15A63                   A

      A15-2A14/2C14    11          A14-2A14/2C14   11     3    A15A64                   A
      A15-2A14/2C14    22          A18-2A10/2C10   22     4    A15A64                   A

      A15-2A17/2C17    11          A17-2A13/2C13   11     4    A17A63                   A

      A15-2A20/2C20    11          A17-2B03/2D03   11     5    A15A70                   A

      A15-2A21/2C21    11          A17-2B13/2D13   11     4    A15A71                   A

      A15-2A22/2C22    11          A17-2B15/2D15   11     4    A15A72                   A

      A15-2A24/2C24    11          A19-2A43/2C43   11     6    A15A74                   A

      A15-2A25/2C25    11          A19-2B20/2D20   11     5    A15A75                   A

      A15-2A26/2C26    11          A13-1A37/1C37   11     7    A15A76                   A

      A15-2A27/2C27    11          A17-2B36/2D36   11     4    A15A77                   A

      A15-2A33/2C33    11          A19-1A21/1C21   11    10    A15A83                   A

      A15-2A34/2C34    11          A13-1B22/1D22   11     9    A18A13                   A
      A15-2A34/2C34    22          A16-2A03/2C03   22     6    A18A13                   A

      A15-2A35/2C35    11          A21-2A35/2C35   11     6    A05A85                   A
      A15-2A35/2C35    22          A14-2A35/2C35   22     3    A05A85                   A

      A15-2A36/2C36    11          A21-2A36/2C36   11     6    A05A86                   A
      A15-2A36/2C36    22          A14-2A36/2C36   22     3    A05A86                   A

      A15-2A37/2C37    11          A21-2A37/2C37   11     6    A05A87                   A
      A15-2A37/2C37    22          A14-2A37/2C37   22     3    A05A87                   A

      A15-2A38/2C38    11          A21-2A38/2C38   11     6    A05A88                   A
      A15-2A38/2C38    22          A14-2A38/2C38   22     3    A05A88                   A

      A15-2A40/2C40    11          A21-2A40/2C40   11     6    A05A90                   A
      A15-2A40/2C40    22          A14-2A40/2C40   22     3    A05A90                   A

      A15-2A41/2C41    11          A21-2A41/2C41   11     6    A05A91                   A
      A15-2A41/2C41    22          A14-2A41/2C41   22     3    A05A91                   A

      A15-2A42/2C42    11          A21-2A42/2C42   11     6    A05A92                   A
      A15-2A42/2C42    22          A14-2A42/2C42   22     3    A05A92                   A

      A15-2A43/2C43    11          A21-2A43/2C43   11     6    A05A93                   A
      A15-2A43/2C43    22          A14-2A43/2C43   22     3    A05A93                   A

      A15-2B05/2D05    11          A14-1B42/1D42   11     4    A15B55                   A
      A15-2B05/2D05    22          A17-1A41/1C41   22     5    A15B55                   A
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PAGE    45   PACK        A15

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS   REV

     A15-2B07/2D07   11         A14-2B07/2D07    11      3    A15B57                   A
     A15-2B07/2D07   22         A17-2B07/2D07    22      4    A15B57                   A

     A15-2B08/2D08   11         A14-2B08/2D08    11      3    A15B58                   A
     A15-2B08/2D08   22         A17-2B08/2D08    22      4    A15B58                   A

     A15-2B09/2D09   11         A14-2B09/2D09    11      3    A15B59                   A
     A15-2B09/2D09   22         A17-2B09/2D09    22      4    A15B59                   A

     A15-2B10/2D10   11         A14-2B10/2D10    11      3    A15B60                   A
     A15-2B10/2D10   22         A17-2B10/2D10    22      4    A15B60                   A

     A15-2B11/2D11   11         A14-2B11/2D11    11      3    A15B61                   A
     A15-2B11/2D11   22         A18-2B07/2D07    22      4    A15B61                   A

     A15-2B12/2D12   11         A14-2B12/2D12    11      3    A15B62                   A
     A15-2B12/2D12   22         A18-2B08/2D08    22      4    A15B62                   A

     A15-2B13/2D13   11         A14-2B13/2D13    11      3    A15B63                   A
     A15-2B13/2D13   22         A18-2B09/2D09    22      4    A15B63                   A

     A15-2B14/2D14   11         A14-2B14/2D14    11      3    A15B64                   A
     A15-2B14/2D14   22         A18-2B10/2D10    22      4    A15B64                   A

     A15-2B19/2D19   11         A02-2A21/2C21    11     11    A15B69                   A
     A15-2B19/2D19   22         A05-1A22/1C22    22     11    A15B69                   A

     A15-2B20/2D20   11         A17-1B42/1D42    11      6    A15B70                   A

     A15-2B21/2D21   11         A19-2B11/2D11    11      5    A15B71                   A

     A15-2B22/2D22   11         A16-1A41/1C41    11      6    A15B72                   A

     A15-2B24/2D24   11         A19-2B17/2D17    11      5    A15B74                   A

     A15-2B25/2D25   11         A14-1B07/1D07    11     10    A15B75                   A

     A15-2B26/2D26   11         A19-2B35/2D35    11      5    A15B76                   A

     A15-2B27/2D27   11         A15-1B03/1D03    11     10    A15B77                   A

     A15-2B31/2D31   11         A17-2B31/2D31    11      4    A05B81                   A
     A15-2B31/2D31   22         A09-2B31/2D31    22      6    A05B81                   A

     A15-2B33/2D33   11         A19-1B22/1D22    11     10    A15B83                   A

     A15-2B34/2D34   11         A19-2B36/2D36    11      5    A15B84                   A

     A15-2B35/2D35   11         A21-2B35/2D35    11      6    A05B85                   A
     A15-2B35/2D35   22         A14-2B35/2D35    22      3    A05B85                   A

     A15-2B36/2D36   11         A21-2B36/2D36    11      6    A05B86                   A
     A15-2B36/2D36   22         A14-2B36/2D36    22      3    A05B86                   A
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PAGE    46  PACK        A15

     ORIGIN          LEVS       DESTINATION       LEVS  LTH   SIGNAL   CBL   COLORS   REV

     A15-2B37/2D37   11         A21-2B37/2D37     11      6   A05B87                    A
     A15-2B37/2D37   22         A14-2B37/2D37     22      3   A05B87                    A

     A15-2B38/2D38   11         A21-2B38/2D38     11      6   A05B88                    A
     A15-2B38/2D38   22         A14-2B38/2D38     22      3   A05B88                    A

     A15-2B40/2D40   11         A21-2B40/2D40     11      6   A05B90                    A
     A15-2B40/2D40   22         A14-2B40/2D40     22      3   A05B90                    A

     A15-2B41/2D41   11         A21-2B41/2D41     11      6   A05B91                    A
     A15-2B41/2D41   22         A14-2B41/2D41     22      3   A05B91                    A

     A15-2B42/2D42   11         A21-2B42/2D42     11      6   A05B92                    A
     A15-2B42/2D42   22         A14-2B42/2D42     22      3   A05B92                    A

     A15-2B43/2D43   11         A21-2B43/2D43     11      6   A05B93                    A
     A15-2B43/2D43   22         A14-2B43/2D43     22      3   A05B93                    A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A16-1A04/1C04	11	A14-1A04/1C04	11	4	A05A04			A
A16-1A04/1C04	22	A17-1A04/1C04	22	3	A05A04			A
A16-1A07/1C07	22	A13-1A07/1C07	22	4	A05A07			A
A16-1A21/1C21	11	A17-1A31/1C31	11	4	A17A31			A
A16-1A22/1C22	11	A14-2A16/2C16	11	8	A16A22			A
A16-1A27/1C27	11	A14-1A05/1C05	11	5	A14A05			A
A16-1A32/1C32	11	A19-1A30/1C30	11	4	A16A32			A
A16-1A33/1C33	11	A17-1A43/1C43	11	4	A17A43			A
A16-1A36/1C36	11	A17-1B43/1D43	11	4	A17B43			A
A16-1A40/1C40	11	A17-2A40/2C40	11	8	A17A90			A
A16-1A41/1C41	11	A15-2B22/2D22	11	6	A15B72			A
A16-1A42/1C42	11	A14-1B21/1D21	11	5	A16A42			A
A16-1A42/1C42	22	A17-1A22/1C22	22	5	A16A42			A
A16-1B03/1D03	11	A17-1B03/1D03	11	3	A05B03			A
A16-1B03/1D03	22	A14-1B03/1D03	22	4	A05B03			A
A16-1B05/1D05	11	A14-1B05/1D05	11	4	A05B05			A
A16-1B05/1D05	22	A17-1B05/1D05	22	3	A05B05			A
A16-1B21/1D21	11	A13-1B24/1D24	11	4	A13B24			A
A16-1B22/1D22	11	A13-1B25/1D25	11	4	A13B25			A
A16-1B24/1D24	11	A13-1B21/1D21	11	4	A16A88			A
A16-1B24/1D24	22	A18-2A38/2C38	22	10	A16A88			A
A16-1B25/1D25	11	A19-2B31/2D31	11	9	A16B25			A
A16-1B26/1D26	11	A18-2A31/2C31	11	9	A16B26			A
A16-1B32/1D32	11	A17-2A15/2C15	11	6	A17A65			A
A16-1B35/1D35	11	A14-1B04/1D04	11	6	A16B35			A
A16-1B36/1D36	11	A17-1B38/1D38	11	3	A17B38			A
A16-1B40/1D40	11	A17-1A28/1C28	11	4	A17A83			A
A16-1B43/1D43	11	A17-2B14/2D14	11	5	A16B43			A
A16-2A03/2C03	11	A18-1A13/1C13	11	7	A16A13			A
A16-2A03/2C03	22	A15-2A34/2C34	22	6	A16A13			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A16-2A04/2C04	11	A19-1A12/1C12	11	8	A16A54			A
A16-2A07/2C07	11	A14-1B08/1D08	11	8	A14B08			A
A16-2A08/2C08	11	A19-1B13/1D13	11	8	A19B13			A
A16-2A09/2C09	11	A17-2A30/2C30	11	5	A17A80			A
A16-2A10/2C10	11	A18-1B26/1D26	11	7	A15B30			A
A16-2A11/2C11	11	A17-1A38/1C38	11	5	A17A38			A
A16-2A12/2C12	11	A17-1A40/1C40	11	5	A16A62			A
A16-2A13/2C13	11	A17-1A30/1C30	11	6	A17A30			A
A16-2A14/2C14	11	A18-1B25/1D25	11	7	A15B29			A
A16-2A15/2C15	11	A18-1B24/1D24	11	7	A15B28			A
A16-2A16/2C16	11	A18-1B28/1D28	11	7	A18B28			A
A16-2A17/2C17	11	A17-2B37/2D37	11	5	A17B87			A
A16-2A18/2C18	11	A17-2A37/2C37	11	4	A17A87			A
A16-2A19/2C19	11	A17-1A32/1C32	11	7	A17A32			A
A16-2A22/2C22	11	A14-1A22/1C22	11	8	A17A64			A
A16-2A22/2C22	22	A17-2A14/2C14	22	3	A17A64			A
A16-2A25/2C25	11	A14-2A05/2C05	11	5	A14A55			A
A16-2A25/2C25	22	A17-1B40/1D40	22	7	A14A55			A
A16-2A26/2C26	22	A19-1B27/1D27	22	8	A15B27			A
A16-2A27/2C27	22	A19-1B26/1D26	22	9	A15B26			A
A16-2A28/2C28	11	A17-1B28/1D28	11	8	A17B28			A
A16-2A29/2C29	11	A17-1A37/1C37	11	7	A17A37			A
A16-2A30/2C30	11	A19-2A17/2C17	11	5	A19A67			A
A16-2A31/2C31	22	A19-1B24/1D24	22	9	A15B24			A
A16-2A32/2C32	22	A19-1A24/1C24	22	9	A15A24			A
A16-2A33/2C33	11	A18-2B30/2D30	11	4	A18B80			A
A16-2A35/2C35	11	A17-2A42/2C42	11	3	A17A92			A
A16-2A36/2C36	11	A17-1A33/1C33	11	8	A16A86			A

ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A16-2A37/2C37	11	A17-2A31/2C31	11	3	A16A87			A
A16-2A38/2C38	11	A17-1B07/1D07	11	11	A17B07			A
A16-2A40/2C40	22	A15-1B42/1D42	22	8	A15B42			A
A16-2A41/2C41	11	A14-1B40/1D40	11	8	A14B40			A
A16-2A42/2C42	22	A19-1B21/1D21	22	10	A14A17			A
A16-2A43/2C43	11	A19-2B12/2D12	11	6	A16A93			A
A16-2B03/2D03	11	A17-2B38/2D38	11	6	A16B53			A
A16-2B04/----		A16-2D04/----			GRNDXX			A
A16-2B05/2D05	11	A17-2A32/2C32	11	5	A16B55			A
A16-2B08/2D08	11	A15-2A05/2C05	11	3	A15A55			A
A16-2B09/2D09	11	A18-1B27/1D27	11	6	A15B31			A
A16-2B10/2D10	11	A18-1A27/1C27	11	7	A15A31			A
A16-2B11/2D11	11	A18-1A26/1C26	11	7	A15A30			A
A16-2B12/2D12	11	A17-2B40/2D40	11	5	A16B62			A
A16-2B13/2D13	11	A17-2A43/2C43	11	6	A16B63			A
A16-2B14/2D14	11	A17-1B30/1D30	11	7	A17B30			A
A16-2B15/2D15	11	A18-1A25/1C25	11	7	A15A29			A
A16-2B16/2D16	11	A18-1A24/1C24	11	7	A15A28			A
A16-2B17/2D17	11	A17-2B30/2D30	11	4	A17B80			A
A16-2B18/----		A16-2D18/----			GRNDXX			A
A16-2B21/----		A16-2D21/----			GRNDXX			A
A16-2B22/2D22	11	A19-2A05/2C05	11	5	A16B72			A
A16-2B24/2D24	11	A14-1A40/1C40	11	7	A02B79			A
A16-2B25/2D25	11	A13-1A40/1C40	11	7	A13A40			A
A16-2B26/2D26	11	A05-1B32/1D32	11	11	A05B32			A
A16-2B27/2D27	22	A19-1A27/1C27	22	8	A15A27			A
A16-2B28/2D28	22	A19-1A26/1C26	22	9	A15A26			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A16-2B30/2D30	22	A19-1B25/1D25	22	9	A15B25			A
A16-2B31/2D31	22	A19-1A25/1C25	22	9	A15A25			A
A16-2B32/2D32	11	A19-2B13/2D13	11	5	A19B63			A
A16-2B33/2D33	11	A19-2B03/2D03	11	6	A19B53			A
A16-2B34/2D34	11	A13-1B33/1D33	11	8	A13B33			A
A16-2B35/2D35	11	A17-2A41/2C41	11	3	A17A91			A
A16-2B36/2D36	11	A17-1B33/1D33	11	8	A16B86			A
A16-2B37/2D37	11	A17-1A29/1C29	11	9	A17A29			A
A16-2B38/2D38	11	A19-1B35/1D35	11	9	A16B88			A
A16-2B40/2D40	11	A15-1A43/1C43	11	8	A15A43			A
A16-2B41/2D41	11	A14-2A33/2C33	11	4	A14A83			A
A16-2B41/2D41	22	A17-2A16/2C16	22	5	A14A83			A
A16-2B42/2D42	11	A19-2A12/2C12	11	6	A16B92			A
A16-2B43/2D43	11	A19-1B18/1D18	11	11	A16B93			A

ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A17-1A03/1C03	11	A14-1A03/1C03	11	4	A05A03			A
A17-1A04/1C04	11	A21-1B40/1D40	11	7	A05A04			A
A17-1A04/1C04	22	A16-1A04/1C04	22	3	A05A04			A
A17-1A05/1C05	11	A18-1A05/1C05	11	3	A05A05			A
A17-1A05/1C05	22	A09-1A05/1C05	22	7	A05A05			A
A17-1A07/1C07	11	A15-1A32/1C32	11	5	A17A07			A
A17-1A08/1C08	11	A21-1A08/1C08	11	5	A05A08			A
A17-1A08/1C08	22	A13-1A08/1C08	22	5	A05A08			A
A17-1A09/1C09	11	A21-1A09/1C09	11	5	A05A09			A
A17-1A09/1C09	22	A13-1A09/1C09	22	5	A05A09			A
A17-1A10/1C10	11	A21-1A10/1C10	11	5	A05A10			A
A17-1A10/1C10	22	A13-1A10/1C10	22	5	A05A10			A
A17-1A11/1C11	11	A21-1A11/1C11	11	5	A05A11			A
A17-1A11/1C11	22	A13-1A11/1C11	22	5	A05A11			A
A17-1A12/1C12	11	A14-2B34/2D34	11	10	A14B84			A
A17-1A12/1C12	22	A18-1A12/1C12	22	3	A14B84			A
A17-1A13/1C13	11	A14-1B33/1D33	11	5	A17A13			A
A17-1A14/1C14	11	A17-1A19/1C19	11	3	A17A14			A
A17-1A15/1C15	11	A19-2B26/2D26	11	9	A17A15			A
A17-1A16/1C16	11	A21-1B16/1D16	11	5	A05A16			A
A17-1A16/1C16	22	A13-1A16/1C16	22	5	A05A16			A
A17-1A17/1C17	11	A19-2B34/2D34	11	10	A17A17			A
A17-1A18/1C18	11	A19-2A27/2C27	11	9	A17A18			A
A17-1A19/1C19	11	A17-1A14/1C14	11	3	A17A14			A
A17-1A20/1C20	11	A19-2B30/2D30	11	9	A17A20			A
A17-1A21/1C21	11	A15-2A03/2C03	11	6	A17A21			A
A17-1A22/1C22	22	A16-1A42/1C42	22	5	A16A42			A
A17-1A24/1C24	11	A19-1A24/1C24	11	4	A15A24			A
A17-1A24/1C24	22	A15-1A24/1C24	22	4	A15A24			A
A17-1A25/1C25	11	A19-1A25/1C25	11	4	A15A25			A
A17-1A25/1C25	22	A15-1A25/1C25	22	4	A15A25			A
A17-1A26/1C26	11	A19-1A26/1C26	11	4	A15A26			A

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      ORIGIN         LEVS      DESTINATION     LEVS  LTH    SIGNAL   CBL  COLORS   REV

      A17-1A26/1C26   22        A15-1A26/1C26   22      4    A15A26                   A

      A17-1A27/1C27   11        A19-1A27/1C27   11      4    A15A27                   A
      A17-1A27/1C27   22        A15-1A27/1C27   22      4    A15A27                   A

      A17-1A28/1C28   11        A16-1B40/1D40   11      4    A17A83                   A
      A17-1A28/1C28   22        A18-1A28/1C28   22      3    A17A83                   A

      A17-1A29/1C29   11        A16-2B37/2D37   11      9    A17A29                   A

      A17-1A30/1C30   11        A16-2A13/2C13   11      6    A17A30                   A

      A17-1A31/1C31   11        A16-1A21/1C21   11      4    A17A31                   A

      A17-1A32/1C32   11        A16-2A19/2C19   11      7    A17A32                   A

      A17-1A33/1C33   11        A16-2A36/2C36   11      8    A16A86                   A

      A17-1A35/1C35   11        A15-1B35/1D35   11      3    A15B35                   A
      A17-1A35/1C35   22        A18-1A35/1C35   22      3    A15B35                   A

      A17-1A36/1C36   11        A18-1A19/1C19   11      4    A17A36                   A

      A17-1A37/1C37   11        A16-2A29/2C29   11      7    A17A37                   A

      A17-1A38/1C38   11        A16-2A11/2C11   11      5    A17A38                   A

      A17-1A40/1C40   11        A16-2A12/2C12   11      5    A16A62                   A

      A17-1A41/1C41   11        A18-1A41/1C41   11      3    A15B55                   A
      A17-1A41/1C41   22        A15-2B05/2D05   22      5    A15B55                   A

      A17-1A42/1C42   11        A14-1B17/1D17   11      5    A14B17                   A

      A17-1A43/1C43   11        A16-1A33/1C33   11      4    A17A43                   A

      A17-1B03/1D03   11        A16-1B03/1D03   11      3    A05B03                   A
      A17-1B03/1D03   22        A21-1A40/1C40   22      7    A05B03                   A

      A17-1B04/1D04   11        A09-1B04/1D04   11      7    A05B04                   A

      A17-1B05/1D05   22        A16-1B05/1D05   22      3    A05B05                   A

      A17-1B07/1D07   11        A16-2A38/2C38   11     11    A17B07                   A

      A17-1B08/1D08   11        A21-1B08/1D08   11      5    A05B08                   A
      A17-1B08/1D08   22        A13-1B08/1D08   22      5    A05B08                   A

      A17-1B09/1D09   11        A21-1B09/1D09   11      5    A05B09                   A
      A17-1B09/1D09   22        A13-1B09/1D09   22      5    A05B09                   A

      A17-1B10/1D10   11        A21-1B10/1D10   11      5    A05B10                   A
      A17-1B10/1D10   22        A13-1B10/1D10   22      5    A05B10                   A
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PAGE    53  PACK        A17

     ORIGIN        LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV

     A17-1B11/1D11  11         A21-1B11/1D11  11     5   A05B11                  A
     A17-1B11/1D11  22         A13-1B11/1D11  22     5   A05B11                  A

     A17-1B12/1D12  11         A13-1B38/1D38  11     6   A13B38                  A
     A17-1B12/1D12  22         A18-1B12/1D12  22     3   A13B38                  A

     A17-1B13/1D13  11         A18-1B32/1D32  11     4   A18B32                  A

     A17-1B14/1D14  11         A19-2A26/2C26  11     9   A17B14                  A

     A17-1B15/1D15  11         A19-2B29/2D29  11    10   A17B15                  A

     A17-1B16/1D16  11         A19-2A29/2C29  11     9   A17B16                  A

     A17-1B17/1D17  11         A17-1B34/1D34  11     4   A17B17                  A

     A17-1B18/1D18  11         A15-1A12/1C12  11     4   A17B18                  A

     A17-1B19/1D19  11         A19-2B27/2D27  11     9   A17B19                  A

     A17-1B20/1D20  11         A17-2B25/2D25  11     9   A17B75                  A

     A17-1B21/1D21  11         A19-2A30/2C30  11     9   A17B21                  A

     A17-1B24/1D24  11         A19-1B24/1D24  11     4   A15B24                  A
     A17-1B24/1D24  22         A15-1B24/1D24  22     4   A15B24                  A

     A17-1B25/1D25  11         A19-1B25/1D25  11     4   A15B25                  A
     A17-1B25/1D25  22         A15-1B25/1D25  22     4   A15B25                  A

     A17-1B26/1D26  11         A19-1B26/1D26  11     4   A15B26                  A
     A17-1B26/1D26  22         A15-1B26/1D26  22     4   A15B26                  A

     A17-1B27/1D27  11         A19-1B27/1D27  11     4   A15B27                  A
     A17-1B27/1D27  22         A15-1B27/1D27  22     4   A15B27                  A

     A17-1B28/1D28  11         A16-2A28/2C28  11     8   A17B28                  A

     A17-1B30/1D30  11         A16-2B14/2D14  11     7   A17B30                  A

     A17-1B33/1D33  11         A16-2B36/2D36  11     8   A16B86                  A

     A17-1B34/1D34  11         A17-1B17/1D17  11     4   A17B17                  A
     A17-1B34/1D34  22         A18-1B34/1D34  22     3   A17B17                  A

     A17-1B36/1D36  11         A18-1B37/1D37  11     3   A18B37                  A

     A17-1B38/1D38  11         A16-1B36/1D36  11     3   A17B38                  A

     A17-1B40/1D40  22         A16-2A25/2C25  22     7   A14A55                  A

     A17-1B41/1D41  11         A15-1A40/1C40  11     4   A15A40                  A

     A17-1B42/1D42  11         A15-2B20/2D20  11     6   A15B70                  A
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PAGE    54  PACK        A17
     ORIGIN         LEVS      DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A17-1B43/1D43  11         A16-1A36/1C36  11     4   A17B43                  A

     A17-2A04/2C04  11         A19-1B37/1D37  11     5   A19B37                  A

     A17-2A05/2C05  11         A19-1A40/1C40  11     5   A19A40                  A

     A17-2A07/2C07  11         A19-2A07/2C07  11     4   A15A57                  A
     A17-2A07/2C07  22         A15-2A07/2C07  22     4   A15A57                  A

     A17-2A08/2C08  11         A19-2A08/2C08  11     4   A15A58                  A
     A17-2A08/2C08  22         A15-2A08/2C08  22     4   A15A58                  A

     A17-2A09/2C09  11         A19-2A09/2C09  11     4   A15A59                  A
     A17-2A09/2C09  22         A15-2A09/2C09  22     4   A15A59                  A

     A17-2A10/2C10  11         A19-2A10/2C10  11     4   A15A60                  A
     A17-2A10/2C10  22         A15-2A10/2C10  22     4   A15A60                  A

     A17-2A11/2C11  11         A19-1A38/1C38  11     6   A19A38                  A

     A17-2A12/2C12  11         A19-1B42/1D42  11     5   A19B42                  A

     A17-2A13/2C13  11         A15-2A17/2C17  11     4   A17A63                  A

     A17-2A14/2C14  22         A16-2A22/2C22  22     3   A17A64                  A

     A17-2A15/2C15  11         A16-1B32/1D32  11     6   A17A65                  A

     A17-2A16/2C16  22         A16-2B41/2D41  22     5   A14A83                  A

     A17-2A17/2C17  11         A18-2A17/2C17  11     3   A15B41                  A
     A17-2A17/2C17  22         A14-1B36/1D36  22     7   A15B41                  A

     A17-2A18/2C18  11         A14-1A38/1C38  11     7   A14A38                  A

     A17-2A24/2C24  11         A19-1B10/1D10  11    10   A19B10                  A

     A17-2A25/2C25  11         A18-1B20/1D20  11     9   A17A75                  A

     A17-2A27/----             A17-2C27/----             GRNDXX                  A

     A17-2A30/2C30  11         A16-2A09/2C09  11     5   A17A80                  A

     A17-2A31/2C31  11         A16-2A37/2C37  11     3   A16A87                  A

     A17-2A32/2C32  11         A16-2B05/2D05  11     5   A16B55                  A

     A17-2A33/2C33  22         A19-2A16/2C16  22     5   A17A83                  A

     A17-2A34/2C34  11         A14-2A34/2C34  11     4   A05A84                  A
     A17-2A34/2C34  22         A21-1A43/1C43  22     8   A05A84                  A

     A17-2A35/----             A17-2C35/----             GRNDXX                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A17-2A37/2C37	11	A16-2A18/2C18	11	4	A17A87			A
A17-2A40/2C40	11	A16-1A40/1C40	11	8	A17A90			A
A17-2A41/2C41	11	A16-2B35/2D35	11	3	A17A91			A
A17-2A42/2C42	11	A16-2A35/2C35	11	3	A17A92			A
A17-2A43/2C43	11	A16-2B13/2D13	11	6	A16B63			A
A17-2B03/2D03	11	A15-2A20/2C20	11	5	A15A70			A
A17-2B03/2D03	22	A18-2B03/2D03	22	3	A15A70			A
A17-2B04/2D04	11	A19-1B41/1D41	11	5	A19B41			A
A17-2B05/2D05	11	A19-1B40/1D40	11	5	A19B40			A
A17-2B07/2D07	11	A19-2B07/2D07	11	4	A15B57			A
A17-2B07/2D07	22	A15-2B07/2D07	22	4	A15B57			A
A17-2B08/2D08	11	A19-2B08/2D08	11	4	A15B58			A
A17-2B08/2D08	22	A15-2B08/2D08	22	4	A15B58			A
A17-2B09/2D09	11	A19-2B09/2D09	11	4	A15B59			A
A17-2B09/2D09	22	A15-2B09/2D09	22	4	A15B59			A
A17-2B10/2D10	11	A19-2B10/2D10	11	4	A15B60			A
A17-2B10/2D10	22	A15-2B10/2D10	22	4	A15B60			A
A17-2B11/2D11	11	A19-1A41/1C41	11	5	A19A41			A
A17-2B12/2D12	11	A19-1A42/1C42	11	5	A19A42			A
A17-2B13/2D13	11	A15-2A21/2C21	11	4	A15A71			A
A17-2B13/2D13	22	A19-1B12/1D12	22	8	A15A71			A
A17-2B14/2D14	11	A16-1B43/1D43	11	5	A16B43			A
A17-2B14/2D14	22	A18-2B14/2D14	22	3	A16B43			A
A17-2B15/2D15	11	A15-2A22/2C22	11	4	A15A72			A
A17-2B15/2D15	22	A18-2B15/2D15	22	3	A15A72			A
A17-2B16/2D16	11	A18-2B16/2D16	11	3	A15B37			A
A17-2B16/2D16	22	A14-1A33/1C33	22	7	A15B37			A
A17-2B17/2D17	11	A18-2B17/2D17	11	3	A15A41			A
A17-2B17/2D17	22	A14-1A36/1C36	22	7	A15A41			A
A17-2B18/2D18	11	A18-2B18/2D18	11	3	A15A42			A
A17-2B18/2D18	22	A14-1A37/1C37	22	7	A15A42			A
A17-2B22/2D22	11	A19-1A37/1C37	11	7	A19A37			A

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PAGE    56  PACK        A17

     ORIGIN        LEVS      DESTINATION     LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A17-2B25/2D25  11        A17-1B20/1D20  11     9   A17B75                 A

     A17-2B27/----            A17-2D27/----             GRNDXX                 A

     A17-2B28/2D28  11        A19-2A03/2C03  11     5   A19A53                 A

     A17-2B29/2D29  11        A18-2A29/2C29  11     3   A18A79                 A

     A17-2B30/2D30  11        A16-2B17/2D17  11     4   A17B80                 A

     A17-2B31/2D31  11        A15-2B31/2D31  11     4   A05B81                 A
     A17-2B31/2D31  22        A18-2B31/2D31  22     3   A05B81                 A

     A17-2B32/2D32  11        A14-1A35/1C35  11     8   A14A35                 A

     A17-2B33/2D33  22        A13-1B34/1D34  22     8   A05B83                 A

     A17-2B34/2D34  11        A10-2B34/2D34  11     7   A05B84                 A

     A17-2B36/2D36  11        A15-2A27/2C27  11     4   A15A77                 A
     A17-2B36/2D36  22        A18-2B36/2D36  22     3   A15A77                 A

     A17-2B37/2D37  11        A16-2A17/2C17  11     5   A17B87                 A

     A17-2B38/2D38  11        A16-2B03/2D03  11     6   A16B53                 A
     A17-2B38/2D38  22        A18-2B38/2D38  22     3   A16B53                 A

     A17-2B40/2D40  11        A16-2B12/2D12  11     5   A16B62                 A
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PAGE    57  PACK        A18

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS  REV

     A18-1A05/1C05   11          A17-1A05/1C05   11      3    A05A05                  A

     A18-1A08/1C08   11          A21-1A12/1C12   11      4    A05A12                  A
     A18-1A08/1C08   22          A13-1A12/1C12   22      6    A05A12                  A

     A18-1A09/1C09   11          A21-1A13/1C13   11      4    A05A13                  A
     A18-1A09/1C09   22          A13-1A13/1C13   22      6    A05A13                  A

     A18-1A10/1C10   11          A21-1A14/1C14   11      4    A05A14                  A
     A18-1A10/1C10   22          A13-1A14/1C14   22      6    A05A14                  A

     A18-1A11/1C11   11          A21-1A15/1C15   11      4    A05A15                  A
     A18-1A11/1C11   22          A13-1A15/1C15   22      6    A05A15                  A

     A18-1A12/1C12   22          A17-1A12/1C12   22      3    A14B84                  A

     A18-1A13/1C13   11          A16-2A03/2C03   11      7    A18A13                  A

     A18-1A15/1C15   11          A19-1B14/1D14   11      3    A18A15                  A

     A18-1A16/1C16   11          A21-1A16/1C16   11      4    A05B16                  A
     A18-1A16/1C16   22          A13-1B16/1D16   22      5    A05B16                  A

     A18-1A17/1C17   11          A19-1A11/1C11   11      3    A18A17                  A

     A18-1A18/1C18   11          A19-1B19/1D19   11      3    A18A18                  A

     A18-1A19/1C19   11          A17-1A36/1C36   11      4    A17A36                  A

     A18-1A20/1C20   11          A19-1B20/1D20   11      3    A18A20                  A

     A18-1A24/1C24   11          A16-2B16/2D16   11      7    A15A28                  A
     A18-1A24/1C24   22          A15-1A28/1C28   22      4    A15A28                  A

     A18-1A25/1C25   11          A16-2B15/2D15   11      7    A15A29                  A
     A18-1A25/1C25   22          A15-1A29/1C29   22      4    A15A29                  A

     A18-1A26/1C26   11          A16-2B11/2D11   11      7    A15A30                  A
     A18-1A26/1C26   22          A15-1A30/1C30   22      4    A15A30                  A

     A18-1A27/1C27   11          A16-2B10/2D10   11      7    A15A31                  A
     A18-1A27/1C27   22          A15-1A31/1C31   22      4    A15A31                  A

     A18-1A28/1C28   11          A19-2A16/2C16   11      7    A17A83                  A
     A18-1A28/1C28   22          A17-1A28/1C28   22      3    A17A83                  A

     A18-1A35/1C35   22          A17-1A35/1C35   22      3    A15B35                  A

     A18-1A40/----               A18-1C40/----                GRNDXX                  A

     A18-1A41/1C41   11          A17-1A41/1C41   11      3    A15B55                  A

     A18-1B08/1D08   11          A21-1B12/1D12   11      4    A05B12                  A
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PAGE    58  PACK        A18

     ORIGIN         LEVS      DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A18-1B08/1D08   22         A13-1B12/1D12   22     6    A05B12                    A

     A18-1B09/1D09   11         A21-1B13/1D13   11     4    A05B13                    A
     A18-1B09/1D09   22         A13-1B13/1D13   22     6    A05B13                    A

     A18-1B10/1D10   11         A21-1B14/1D14   11     4    A05B14                    A
     A18-1B10/1D10   22         A13-1B14/1D14   22     6    A05B14                    A

     A18-1B11/1D11   11         A21-1B15/1D15   11     4    A05B15                    A
     A18-1B11/1D11   22         A13-1B15/1D15   22     6    A05B15                    A

     A18-1B12/1D12   22         A17-1B12/1D12   22     3    A13B38                    A

     A18-1B14/1D14   11         A19-1A13/1C13   11     3    A18B14                    A

     A18-1B15/1D15   11         A19-1A14/1C14   11     3    A18B15                    A

     A18-1B16/1D16   11         A19-1B15/1D15   11     3    A18B16                    A

     A18-1B19/1D19   11         A19-1A19/1C19   11     3    A18B19                    A

     A18-1B20/1D20   11         A17-2A25/2C25   11     9    A17A75                    A

     A18-1B21/1D21   11         A19-1A20/1C20   11     3    A18B21                    A

     A18-1B24/1D24   11         A16-2A15/2C15   11     7    A15B28                    A
     A18-1B24/1D24   22         A15-1B28/1D28   22     4    A15B28                    A

     A18-1B25/1D25   11         A16-2A14/2C14   11     7    A15B29                    A
     A18-1B25/1D25   22         A15-1B29/1D29   22     4    A15B29                    A

     A18-1B26/1D26   11         A16-2A10/2C10   11     7    A15B30                    A
     A18-1B26/1D26   22         A15-1B30/1D30   22     4    A15B30                    A

     A18-1B27/1D27   11         A16-2B09/2D09   11     6    A15B31                    A
     A18-1B27/1D27   22         A15-1B31/1D31   22     4    A15B31                    A

     A18-1B28/1D28   11         A16-2A16/2C16   11     7    A18B28                    A

     A18-1B32/1D32   11         A17-1B13/1D13   11     4    A18B32                    A

     A18-1B34/1D34   22         A17-1B34/1D34   22     3    A17B17                    A

     A18-1B37/1D37   11         A17-1B36/1D36   11     3    A18B37                    A

     A18-1B41/1D41   11         A15-1B38/1D38   11     4    A15B38                    A

     A18-2A04/2C04   11         A19-2B32/2D32   11     5    A19B82                    A

     A18-2A05/2C05   11         A19-2A38/2C38   11     6    A19A88                    A

     A18-2A07/2C07   22         A15-2A11/2C11   22     4    A15A61                    A

     A18-2A08/2C08   22         A15-2A12/2C12   22     4    A15A62                    A
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PAGE    59  PACK          A18
     ORIGIN         LEVS      DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A18-2A09/2C09  22         A15-2A13/2C13  22      4   A15A63                     A
     A18-2A10/2C10  22         A15-2A14/2C14  22      4   A15A64                     A
     A18-2A11/2C11  11         A19-2A35/2C35  11      5   A19A85                     A
     A18-2A12/2C12  11         A19-2B40/2D40  11      5   A19B90                     A
     A18-2A17/2C17  11         A17-2A17/2C17  11      3   A15B41                     A
     A18-2A27/----             A18-2C27/----              GRNDXX                     A
     A18-2A29/2C29  11         A17-2B29/2D29  11      3   A18A79                     A
     A18-2A31/2C31  11         A16-1B26/1D26  11      9   A16B26                     A
     A18-2A35/----             A18-2C35/----              GRNDXX                     A
     A18-2A38/2C38  22         A16-1B24/1D24  22     10   A16A88                     A
     A18-2B03/2D03  22         A17-2B03/2D03  22      3   A15A70                     A
     A18-2B04/2D04  11         A19-2A32/2C32  11      5   A19A82                     A
     A18-2B05/2D05  11         A19-2A36/2C36  11      6   A19A86                     A
     A18-2B07/2D07  22         A15-2B11/2D11  22      4   A15B61                     A
     A18-2B08/2D08  22         A15-2B12/2D12  22      4   A15B62                     A
     A18-2B09/2D09  22         A15-2B13/2D13  22      4   A15B63                     A
     A18-2B10/2D10  22         A15-2B14/2D14  22      4   A15B64                     A
     A18-2B11/2D11  11         A19-2B42/2D42  11      6   A19B92                     A
     A18-2B12/2D12  11         A19-2B38/2D38  11      5   A19B88                     A
     A18-2B14/2D14  22         A17-2B14/2D14  22      3   A16B43                     A
     A18-2B15/2D15  22         A17-2B15/2D15  22      3   A15A72                     A
     A18-2B16/2D16  11         A17-2B16/2D16  11      3   A15B37                     A
     A18-2B17/2D17  11         A17-2B17/2D17  11      3   A15A41                     A
     A18-2B18/2D18  11         A17-2B18/2D18  11      3   A15A42                     A
     A18-2B22/2D22  11         A19-2A33/2C33  11      4   A19A83                     A
     A18-2B27/----             A18-2D27/----              GRNDXX                     A
     A18-2B28/2D28  11         A19-1A10/1C10  11     10   A19A10                     A
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PAGE    60  PACK        A18
      ORIGIN         LEVS      DESTINATION      LEVS  LTH    SIGNAL  CBL  COLORS  REV

      A18-2B30/2C30  11         A16-2A33/2C33  11      4   A18B80                 A

      A18-2B31/2C31  11         A21-2B19/2D19  11      5   A05B81                 A
      A18-2B31/2C31  22         A17-2B31/2D31  22      3   A05B81                 A

      A18-2B36/2C36  22         A17-2B36/2D36  22      3   A15A77                 A

      A18-2B38/2C38  22         A17-2B38/2D38  22      3   A16B53                 A
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PAGE    61  PACK        A19
     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A19-1A09/1C09   11          A13-1A22/1C22   11     6   A13A22                  A

     A19-1A10/1C10   11          A18-2B28/2D28   11    10   A19A10                  A

     A19-1A11/1C11   11          A18-1A17/1C17   11     3   A18A17                  A

     A19-1A12/1C12   11          A16-2A04/2C04   11     8   A16A54                  A

     A19-1A13/1C13   11          A18-1B14/1D14   11     3   A18B14                  A

     A19-1A14/1C14   11          A18-1B15/1D15   11     3   A18B15                  A

     A19-1A16/1C16   11          A13-1B26/1D26   11     6   A13B26                  A

     A19-1A17/1C17   11          A13-1B27/1D27   11     6   A13B27                  A

     A19-1A18/1C18   11          A13-1B28/1D28   11     6   A13B28                  A

     A19-1A19/1C19   11          A18-1B19/1D19   11     3   A18B19                  A

     A19-1A20/1C20   11          A18-1B21/1D21   11     3   A18B21                  A

     A19-1A21/1C21   11          A15-2A33/2C33   11    10   A15A83                  A

     A19-1A22/1C22   11          A15-1A35/1C35   11     5   A15A35                  A

     A19-1A24/1C24   11          A17-1A24/1C24   11     4   A15A24                  A
     A19-1A24/1C24   22          A16-2A32/2C32   22     9   A15A24                  A

     A19-1A25/1C25   11          A17-1A25/1C25   11     4   A15A25                  A
     A19-1A25/1C25   22          A16-2B31/2D31   22     9   A15A25                  A

     A19-1A26/1C26   11          A17-1A26/1C26   11     4   A15A26                  A
     A19-1A26/1C26   22          A16-2B28/2D28   22     9   A15A26                  A

     A19-1A27/1C27   11          A17-1A27/1C27   11     4   A15A27                  A
     A19-1A27/1C27   22          A16-2B27/2D27   22     8   A15A27                  A

     A19-1A28/1C28   11          A13-1A24/1C24   11     6   A13A24                  A

     A19-1A29/1C29   11          A13-1A25/1C25   11     6   A13A25                  A

     A19-1A30/1C30   11          A16-1A32/1C32   11     4   A16A32                  A

     A19-1A31/1C31   11          A13-1A26/1C26   11     6   A13A26                  A

     A19-1A32/1C32   11          A13-1A27/1C27   11     6   A13A27                  A

     A19-1A33/1C33   11          A13-1A28/1C28   11     6   A13A28                  A

     A19-1A34/1C34   11          A13-1B30/1D30   11     6   A13B30                  A

     A19-1A37/1C37   11          A17-2B22/2D22   11     7   A19A37                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A19-1A38/1C38	11	A17-2A11/2C11	11	6	A19A38			A
A19-1A40/1C40	11	A17-2A05/2C05	11	5	A19A40			A
A19-1A41/1C41	11	A17-2B11/2D11	11	5	A19A41			A
A19-1A42/1C42	11	A17-2B12/2D12	11	5	A19A42			A
A19-1B04/----		A19-1D04/----			GRNDXX			A
A19-1B08/----		A19-1D08/----			GRNDXX			A
A19-1B10/1D10	11	A17-2A24/2C24	11	10	A19B10			A
A19-1B12/1D12	22	A17-2B13/2D13	22	8	A15A71			A
A19-1B13/1D13	11	A16-2A08/2C08	11	8	A19B13			A
A19-1B14/1D14	11	A18-1A15/1C15	11	3	A18A15			A
A19-1B15/1D15	11	A18-1B16/1D16	11	3	A18B16			A
A19-1B16/----		A19-1D16/----			GRNDXX			A
A19-1B18/1D18	11	A16-2B43/2D43	11	11	A16B93			A
A19-1B19/1D19	11	A18-1A18/1C18	11	3	A18A18			A
A19-1B20/1D20	11	A18-1A20/1C20	11	3	A18A20			A
A19-1B21/1D21	11	A14-1A17/1C17	11	6	A14A17			A
A19-1B21/1D21	22	A16-2A42/2C42	22	10	A14A17			A
A19-1B22/1D22	11	A15-2B33/2D33	11	10	A15B83			A
A19-1B24/1D24	11	A17-1B24/1D24	11	4	A15B24			A
A19-1B24/1D24	22	A16-2A31/2C31	22	9	A15B24			A
A19-1B25/1D25	11	A17-1B25/1D25	11	4	A15B25			A
A19-1B25/1D25	22	A16-2B30/2D30	22	9	A15B25			A
A19-1B26/1D26	11	A17-1B26/1D26	11	4	A15B26			A
A19-1B26/1D26	22	A16-2A27/2C27	22	9	A15B26			A
A19-1B27/1D27	11	A17-1B27/1D27	11	4	A15B27			A
A19-1B27/1D27	22	A16-2A26/2C26	22	8	A15B27			A
A19-1B30/1D30	11	A14-1A34/1C34	11	6	A14A34			A
A19-1B33/1D33	11	A14-1B34/1D34	11	6	A14B34			A
A19-1B35/1D35	11	A16-2B38/2D38	11	9	A16B88			A

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PAGE    63  PACK        A19

     ORIGIN          LEVS       DESTINATION       LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A19-1B37/1D37   11         A17-2A04/2C04     11     5    A19B37                 A

     A19-1B40/1D40   11         A17-2B05/2D05     11     5    A19B40                 A

     A19-1B41/1D41   11         A17-2B04/2D04     11     5    A19B41                 A

     A19-1B42/1D42   11         A17-2A12/2C12     11     5    A19B42                 A

     A19-2A03/2C03   11         A17-2B28/2D28     11     5    A19A53                 A

     A19-2A05/2C05   11         A16-2B22/2D22     11     5    A16B72                 A

     A19-2A07/2C07   11         A17-2A07/2C07     11     4    A15A57                 A

     A19-2A08/2C08   11         A17-2A08/2C08     11     4    A15A58                 A

     A19-2A09/2C09   11         A17-2A09/2C09     11     4    A15A59                 A

     A19-2A10/2C10   11         A17-2A10/2C10     11     4    A15A60                 A

     A19-2A12/2C12   11         A16-2B42/2D42     11     6    A16B92                 A

     A19-2A16/2C16   11         A18-1A28/1C28     11     7    A17A83                 A
     A19-2A16/2C16   22         A17-2A33/2C33     22     5    A17A83                 A

     A19-2A17/2C17   11         A16-2A30/2C30     11     5    A19A67                 A

     A19-2A26/2C26   11         A17-1B14/1D14     11     9    A17B14                 A

     A19-2A27/2C27   11         A17-1A18/1C18     11     9    A17A18                 A

     A19-2A29/2C29   11         A17-1B16/1D16     11     9    A17B16                 A

     A19-2A30/2C30   11         A17-1B21/1D21     11     9    A17B21                 A

     A19-2A32/2C32   11         A18-2B04/2D04     11     5    A19A82                 A

     A19-2A33/2C33   11         A18-2B22/2D22     11     4    A19A83                 A

     A19-2A35/2C35   11         A18-2A11/2C11     11     5    A19A85                 A

     A19-2A36/2C36   11         A18-2B05/2D05     11     6    A19A86                 A

     A19-2A38/2C38   11         A18-2A05/2C05     11     6    A19A88                 A

     A19-2A41/2C41   11         A14-2A03/2C03     11     7    A14A53                 A

     A19-2A43/2C43   11         A15-2A24/2C24     11     6    A15A74                 A

     A19-2B03/2D03   11         A16-2B33/2D33     11     6    A19B53                 A

     A19-2B07/2D07   11         A17-2B07/2D07     11     4    A15B57                 A

     A19-2B08/2D08   11         A17-2B08/2D08     11     4    A15B58                 A
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PAGE    64  PACK        A19
     ORIGIN         LEVS       DESTINATION       LEVS  LTH    SIGNAL   CBL   COLORS   REV

     A19-2B09/2D09   11       A17-2B09/2D09   11      4    A15B59                     A
     A19-2B10/2D10   11       A17-2B10/2D10   11      4    A15B60                     A
     A19-2B11/2D11   11       A15-2B21/2D21   11      5    A15B71                     A
     A19-2B12/2D12   11       A16-2A43/2C43   11      6    A16A93                     A
     A19-2B13/2D13   11       A16-2B32/2D32   11      5    A19B63                     A
     A19-2B16/----            A19-2D16/----                GRNDXX                     A
     A19-2B17/2D17   11       A15-2B24/2D24   11      5    A15B74                     A
     A19-2B18/----            A19-2D18/----                GRNDXX                     A
     A19-2B20/2D20   11       A15-2A25/2C25   11      5    A15A75                     A
     A19-2B26/2D26   11       A17-1A15/1C15   11      9    A17A15                     A
     A19-2B27/2D27   11       A17-1B19/1D19   11      9    A17B19                     A
     A19-2B29/2D29   11       A17-1B15/1D15   11     10    A17B15                     A
     A19-2B30/2D30   11       A17-1A20/1C20   11      9    A17A20                     A
     A19-2B31/2D31   11       A16-1B25/1D25   11      9    A16B25                     A
     A19-2B32/2D32   11       A18-2A04/2C04   11      5    A19B82                     A
     A19-2B33/2D33   11       A14-2A04/2C04   11      7    A14A54                     A
     A19-2B34/2D34   11       A17-1A17/1C17   11     10    A17A17                     A
     A19-2B35/2D35   11       A15-2B26/2D26   11      5    A15B76                     A
     A19-2B36/2D36   11       A15-2B34/2D34   11      5    A15B84                     A
     A19-2B37/----            A19-2D37/----                GRNDXX                     A
     A19-2B38/2D38   11       A18-2B12/2D12   11      5    A19B88                     A
     A19-2B40/2D40   11       A18-2A12/2C12   11      5    A19B90                     A
     A19-2B42/2D42   11       A18-2B11/2D11   11      6    A19B92                     A
     A19-2B43/2D43   11       A14-2B03/2D03   11      7    A14B53                     A
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PAGE    65  PACK        A21
     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A21-1A08/1C08   11          A17-1A08/1C08   11     5   A05A08                 A
     A21-1A09/1C09   11          A17-1A09/1C09   11     5   A05A09                 A
     A21-1A10/1C10   11          A17-1A10/1C10   11     5   A05A10                 A
     A21-1A11/1C11   11          A17-1A11/1C11   11     5   A05A11                 A
     A21-1A12/1C12   11          A18-1A08/1C08   11     4   A05A12                 A
     A21-1A13/1C13   11          A18-1A09/1C09   11     4   A05A13                 A
     A21-1A14/1C14   11          A18-1A10/1C10   11     4   A05A14                 A
     A21-1A15/1C15   11          A18-1A11/1C11   11     4   A05A15                 A
     A21-1A16/1C16   11          A18-1A16/1C16   11     4   A05B16                 A
     A21-1A17/1C17   11          B21-1A08/1C08   11    14   B05A08                 A
     A21-1A18/1C18   11          B21-1A09/1C09   11    14   B05A09                 A
     A21-1A19/1C19   11          B21-1A10/1C10   11    14   B05A10                 A
     A21-1A20/1C20   11          B21-1A11/1C11   11    14   B05A11                 A
     A21-1A21/1C21   11          B21-1A12/1C12   11    14   B05A12                 A
     A21-1A22/1C22   11          B21-1A13/1C13   11    14   B05A13                 A
     A21-1A24/1C24   11          B21-1A14/1C14   11    14   B05A14                 A
     A21-1A25/1C25   11          B21-1A15/1C15   11    14   B05A15                 A
     A21-1A26/1C26   11          B21-1A16/1C16   11    14   B05B16                 A
     A21-1A36/1C36   22          A09-2A13/2C13   22    10   A07A17                 A
     A21-1A37/1C37   11          B21-1A36/1C36   11    15   B07A17                 A
     A21-1A40/1C40   22          A17-1B03/1D03   22     7   A05B03                 A
     A21-1A41/1C41   11          B16-1B27/1D27   11    14   B16B27                 A
     A21-1A43/1C43   22          A17-2A34/2C34   22     8   A05A84                 A
     A21-1B08/1D08   11          A17-1B08/1D08   11     5   A05B08                 A
     A21-1B09/1D09   11          A17-1B09/1D09   11     5   A05B09                 A
     A21-1B10/1D10   11          A17-1B10/1D10   11     5   A05B10                 A
     A21-1B11/1D11   11          A17-1B11/1D11   11     5   A05B11                 A
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PAGE    66  PACK        A21
     ORIGIN        LEVS      DESTINATION     LEVS  LTH   SIGNAL  CBL  COLORS  REV

     A21-1B12/1C12  11        A18-1B08/1D08  11     4   A05B12                 A
     A21-1B13/1C13  11        A18-1B09/1D09  11     4   A05B13                 A
     A21-1B14/1C14  11        A18-1B10/1D10  11     4   A05B14                 A
     A21-1B15/1C15  11        A18-1B11/1D11  11     4   A05B15                 A
     A21-1B16/1C16  11        A17-1A16/1C16  11     5   A05A16                 A
     A21-1B17/1C17  11        B21-1B08/1D08  11    14   B05B08                 A
     A21-1B18/1C18  11        B21-1B09/1D09  11    14   B05B09                 A
     A21-1B19/1C19  11        B21-1B10/1D10  11    14   B05B10                 A
     A21-1B20/1C20  11        B21-1B11/1D11  11    14   B05B11                 A
     A21-1B21/1C21  11        B21-1B12/1D12  11    14   B05B12                 A
     A21-1B22/1C22  11        B21-1B13/1D13  11    14   B05B13                 A
     A21-1B24/1C24  11        B21-1B14/1D14  11    14   B05B14                 A
     A21-1B25/1C25  11        B21-1B15/1D15  11    14   B05B15                 A
     A21-1B26/1C26  11        B21-1B16/1D16  11    14   B05A16                 A
     A21-1B36/1C36  22        A09-2B13/2D13  22    10   A09B63                 A
     A21-1B37/1C37  11        B21-1B36/1D36  11    15   B18B37                 A
     A21-1B40/1C40  11        A17-1A04/1C04  11     7   A05A04                 A
     A21-1B41/1C41  11        B16-1B28/1D28  11    14   B16B28                 A
     A21-1B43/1C43  11        B21-1A43/1C43  11    15   B17B43                 A
     A21-2A18/2C18  11        A13-1B37/1D37  11     8   A13B37                 A
     A21-2A19/2C19  11        B21-2A18/2C18  11    15   B13B37                 A
     A21-2A27/2C27  11        B21-2A35/2C35  11    16   B05A85                 A
     A21-2A28/2C28  11        B21-2A36/2C36  11    16   B05A86                 A
     A21-2A29/2C29  11        B21-2A37/2C37  11    16   B05A87                 A
     A21-2A30/2C30  11        B21-2A38/2C38  11    16   B05A88                 A
     A21-2A31/2C31  11        B21-2A40/2C40  11    16   B05A90                 A
     A21-2A32/2C32  11        B21-2A41/2C41  11    16   B05A91                 A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
A21-2A33/2C33	11	B21-2A42/2C42	11	16	B05A92			A
A21-2A34/2C34	11	B21-2A43/2C43	11	16	B05A93			A
A21-2A35/2C35	11	A15-2A35/2C35	11	6	A05A85			A
A21-2A36/2C36	11	A15-2A36/2C36	11	6	A05A86			A
A21-2A37/2C37	11	A15-2A37/2C37	11	6	A05A87			A
A21-2A38/2C38	11	A15-2A38/2C38	11	6	A05A88			A
A21-2A40/2C40	11	A15-2A40/2C40	11	6	A05A90			A
A21-2A41/2C41	11	A15-2A41/2C41	11	6	A05A91			A
A21-2A42/2C42	11	A15-2A42/2C42	11	6	A05A92			A
A21-2A43/2C43	11	A15-2A43/2C43	11	6	A05A93			A
A21-2B18/2D18	11	B21-2B19/2D19	11	15	B05B81			A
A21-2B19/2D19	11	A18-2B31/2D31	11	5	A05B81			A
A21-2B27/2D27	11	B21-2B35/2D35	11	16	B05B85			A
A21-2B28/2D28	11	B21-2B36/2D36	11	16	B05B86			A
A21-2B29/2D29	11	B21-2B37/2D37	11	16	B05B87			A
A21-2B30/2D30	11	B21-2B38/2D38	11	16	B05B88			A
A21-2B31/2D31	11	B21-2B40/2D40	11	16	B05B90			A
A21-2B32/2D32	11	B21-2B41/2D41	11	16	B05B91			A
A21-2B33/2D33	11	B21-2B42/2D42	11	16	B05B92			A
A21-2B34/2D34	11	B21-2B43/2D43	11	16	B05B93			A
A21-2B35/2D35	11	A15-2B35/2D35	11	6	A05B85			A
A21-2B36/2D36	11	A15-2B36/2D36	11	6	A05B86			A
A21-2B37/2D37	11	A15-2B37/2D37	11	6	A05B87			A
A21-2B38/2D38	11	A15-2B38/2D38	11	6	A05B88			A
A21-2B40/2D40	11	A15-2B40/2D40	11	6	A05B90			A
A21-2B41/2D41	11	A15-2B41/2D41	11	6	A05B91			A
A21-2B42/2D42	11	A15-2B42/2D42	11	6	A05B92			A

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PAGE    68  PACK        A21

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL  CBL  COLORS  REV

     A21-2B43/2C43  11          A15-2B43/2D43  11      6    A05B93                  A
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PAGE    69  PACK        B01
     ORIGIN          LEVS       DESTINATION       LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B01-1A03/1C03   11        B05-2B03/2D03   11     9   B05B53                  A
     B01-1A04/1C04   11        B04-1B04/1D04   11     4   B05B72                  A
     B01-1A07/1C07   11        B02-1A04/1C04   11     3   B05A04                  A
     B01-1A14/1C14   11        B05-2A08/2C08   11     8   B01A14                  A
     B01-1A19/1C19   11        B05-2B17/2D17   11     8   B05B67                  A
     B01-1A20/1C20   11        B05-1A36/1C36   11     5   B01A20                  A
     B01-1A22/1C22   11        B05-1A33/1C33   11     5   B05A33                  A
     B01-1A29/1C29   11        B05-2A05/2C05   11     6   B01A29                  A
     B01-1A35/1C35   11        B05-1A34/1C34   11     5   B02A74                  A
     B01-1A37/1C37   11        B02-1A37/1C37   11     3   B01A37                  A
     B01-1A38/1C38   11        B02-1A38/1C38   11     3   B01A38                  A
     B01-1A40/1C40   11        B02-1A40/1C40   11     3   B01A40                  A
     B01-1A41/1C41   11        B02-1A41/1C41   11     3   B01A41                  A
     B01-1A42/1C42   11        B02-1A42/1C42   11     3   B01A42                  A
     B01-1A43/1C43   11        B02-1A43/1C43   11     3   B01A43                  A
     B01-1B03/1D03   11        B05-1B43/1D43   11     7   B01B03                  A
     B01-1B04/1D04   11        B05-1A41/1C41   11     7   B01B04                  A
     B01-1B14/1D14   11        B05-2A07/2C07   11     8   B01B14                  A
     B01-1B15/1D15   11        B02-2A42/2C42   11    11   B01B15                  A
     B01-1B19/1D19   11        B02-2B30/2D30   11     9   B01B19                  A
     B01-1B22/1D22   11        B05-2B16/2D16   11     8   B05B66                  A
     B01-1B29/1D29   11        B02-2A41/2C41   11     9   B01B29                  A
     B01-1B30/1D30   11        B02-2B32/2D32   11     8   B01B30                  A
     B01-1B37/1D37   11        B02-1B37/1D37   11     3   B01B37                  A
     B01-1B38/1D38   11        B02-1B38/1D38   11     3   B01B38                  A
     B01-1B40/1D40   11        B02-1B40/1D40   11     3   B01B40                  A
     B01-1B41/1D41   11        B02-1B41/1D41   11     3   B01B41                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B01-1B42/1D42	11	B02-1B42/1D42	11	3	B01B42			A
B01-1B43/1D43	11	B02-1B43/1D43	11	3	B01B43			A
B01-2A04/2C04	11	B05-2B10/2D10	11	5	B05B60			A
B01-2A09/2C09	11	B05-2A27/2C27	11	5	B01A59			A
B01-2A15/----		B01-2C15/----			GRNDXX			A
B01-2A19/----		B01-2C19/----			GRNDXX			A
B01-2A27/----		B01-2C27/----			GRNDXX			A
B01-2A31/----		B01-2C31/----			GRNDXX			A
B01-2A35/----		B01-2C35/----			GRNDXX			A
B01-2A43/----		B01-2C43/----			GRNDXX			A
B01-2B04/2D04	11	B02-2A36/2C36	11	6	B01B54			A
B01-2B09/2D09	11	B02-2A38/2C38	11	5	B05A74			A
B01-2B10/2D10	11	B05-2B25/2D25	11	5	B05B75			A
B01-2B13/2D13	11	B05-2A21/2C21	11	5	B01B63			A
B01-2B14/2D14	11	B04-2A26/2C26	11	4	B04A76			A
B01-2B15/----		B01-2D15/----			GRNDXX			A
B01-2B19/----		B01-2D19/----			GRNDXX			A
B01-2B27/----		B01-2D27/----			GRNDXX			A
B01-2B31/----		B01-2D31/----			GRNDXX			A
B01-2B35/----		B01-2D35/----			GRNDXX			A
B01-2B43/----		B01-2D43/----			GRNDXX			A

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PAGE     71  PACK         B02
     ORIGIN        LEVS      DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B02-1A03/1C03  11        B05-1A03/1C03  11     4   B05A03                 A

     B02-1A04/1C04  11        B01-1A07/1C07  11     3   B05A04                 A
     B02-1A04/1C04  22        B05-1A04/1C04  22     4   B05A04                 A

     B02-1A05/1C05  11        B05-1A05/1C05  11     4   B05A05                 A

     B02-1A07/1C07  11        B05-1A07/1C07  11     4   B05A07                 A

     B02-1A08/1C08  22        B05-1A08/1C08  22     4   B05A08                 A

     B02-1A09/1C09  22        B05-1A09/1C09  22     4   B05A09                 A

     B02-1A10/1C10  22        B05-1A10/1C10  22     4   B05A10                 A

     B02-1A11/1C11  22        B05-1A11/1C11  22     4   B05A11                 A

     B02-1A12/1C12  22        B05-1A12/1C12  22     4   B05A12                 A

     B02-1A13/1C13  22        B05-1A13/1C13  22     4   B05A13                 A

     B02-1A14/1C14  22        B05-1A14/1C14  22     4   B05A14                 A

     B02-1A15/1C15  22        B05-1A15/1C15  22     4   B05A15                 A

     B02-1A16/1C16  22        B05-1A16/1C16  22     4   B05A16                 A

     B02-1A19/1C19  11        B05-1B42/1D42  11     6   B02A19                 A

     B02-1A20/1C20  11        B14-2A32/2C32  11    12   B14A82                 A

     B02-1A21/1C21  11        B05-2A14/2C14  11     8   B05A64                 A

     B02-1A24/1C24  11        B04-1A24/1C24  11     4   B04A24                 A

     B02-1A25/1C25  11        B04-1A25/1C25  11     4   B04A25                 A

     B02-1A26/1C26  11        B04-1A26/1C26  11     4   B04A26                 A

     B02-1A27/1C27  11        B04-1A27/1C27  11     4   B04A27                 A

     B02-1A28/1C28  11        B04-1A28/1C28  11     4   B04A28                 A

     B02-1A29/1C29  11        B04-1A29/1C29  11     4   B04A29                 A

     B02-1A30/1C30  11        B04-1A30/1C30  11     4   B04A30                 A

     B02-1A31/1C31  11        B04-1A31/1C31  11     4   B04A31                 A

     B02-1A35/1C35  11        B05-2B07/2D07  11     6   B05B57                 A

     B02-1A37/1C37  11        B01-1A37/1C37  11     3   B01A37                 A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B02-1A38/1C38	11	B01-1A38/1C38	11	3	B01A38			A
B02-1A40/1C40	11	B01-1A40/1C40	11	3	B01A40			A
B02-1A41/1C41	11	B01-1A41/1C41	11	3	B01A41			A
B02-1A42/1C42	11	B01-1A42/1C42	11	3	B01A42			A
B02-1A43/1C43	11	B01-1A43/1C43	11	3	B01A43			A
B02-1B03/1D03	11	B05-1B03/1D03	11	4	B05B03			A
B02-1B08/1D08	22	B05-1B08/1D08	22	4	B05B08			A
B02-1B09/1D09	22	B05-1B09/1D09	22	4	B05B09			A
B02-1B10/1D10	22	B05-1B10/1D10	22	4	B05B10			A
B02-1B11/1D11	22	B05-1B11/1D11	22	4	B05B11			A
B02-1B12/1D12	22	B05-1B12/1D12	22	4	B05B12			A
B02-1B13/1D13	22	B05-1B13/1D13	22	4	B05B13			A
B02-1B14/1D14	22	B05-1B14/1D14	22	4	B05B14			A
B02-1B15/1D15	22	B05-1B15/1D15	22	4	B05B15			A
B02-1B16/1D16	22	B05-1B16/1D16	22	4	B05B16			A
B02-1B24/1D24	11	B04-1B24/1D24	11	4	B04B24			A
B02-1B25/1D25	11	B04-1B25/1D25	11	4	B04B25			A
B02-1B26/1D26	11	B04-1B26/1D26	11	4	B04B26			A
B02-1B27/1D27	11	B04-1B27/1D27	11	4	B04B27			A
B02-1B28/1D28	11	B04-1B28/1D28	11	4	B04B28			A
B02-1B29/1D29	11	B04-1B29/1D29	11	4	B04B29			A
B02-1B30/1D30	11	B04-1B30/1D30	11	4	B04B30			A
B02-1B31/1D31	11	B04-1B31/1D31	11	4	B04B31			A
B02-1B36/1D36	11	B14-2A17/2C17	11	10	B02B36			A
B02-1B37/1D37	11	B01-1B37/1D37	11	3	B01B37			A
B02-1B38/1D38	11	B01-1B38/1D38	11	3	B01B38			A
B02-1B40/1D40	11	B01-1B40/1D40	11	3	B01B40			A

ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B02-1B41/1D41	11	B01-1B41/1D41	11	3	B01B41			A
B02-1B42/1D42	11	B01-1B42/1D42	11	3	B01B42			A
B02-1B43/1D43	11	B01-1B43/1D43	11	3	B01B43			A
B02-2A03/2C03	11	B04-2B20/2D20	11	5	B04B70			A
B02-2A07/2C07	11	B04-2A07/2C07	11	4	B04A57			A
B02-2A08/2C08	11	B04-2A08/2C08	11	4	B04A58			A
B02-2A09/2C09	11	B04-2A09/2C09	11	4	B04A59			A
B02-2A10/2C10	11	B04-2A10/2C10	11	4	B04A60			A
B02-2A11/2C11	11	B04-2A11/2C11	11	4	B04A61			A
B02-2A12/2C12	11	B04-2A12/2C12	11	4	B04A62			A
B02-2A13/2C13	11	B04-2A13/2C13	11	4	B04A63			A
B02-2A14/2C14	11	B04-2A14/2C14	11	4	B04A64			A
B02-2A20/2C20	11	B05-2A26/2C26	11	4	B02A70			A
B02-2A21/2C21	11	B15-2B19/2D19	11	11	B15B69			A
B02-2A22/2C22	11	B05-1A43/1C43	11	6	B05A43			A
B02-2A24/2C24	22	B05-1A34/1C34	22	7	B02A74			A
B02-2A25/2C25	11	B05-2A03/2C03	11	5	B05A53			A
B02-2A26/2C26	11	B04-2B34/2D34	11	4	B04B84			A
B02-2A34/2C34	11	B05-2A34/2C34	11	4	B05A84			A
B02-2A36/2C36	11	B01-2B04/2D04	11	6	B01B54			A
B02-2A37/2C37	11	B05-2A20/2C20	11	5	B05A70			A
B02-2A38/2C38	11	B01-2B09/2D09	11	5	B05A74			A
B02-2A38/2C38	22	B05-2A24/2C24	22	5	B05A74			A
B02-2A40/2C40	11	B05-2A15/2C15	11	6	B05A65			A
B02-2A41/2C41	11	B01-1B29/1D29	11	9	B01B29			A
B02-2A41/2C41	22	B05-1B35/1D35	22	9	B01B29			A
B02-2A42/2C42	11	B01-1B15/1D15	11	11	B01B15			A
B02-2A43/2C43	11	B04-2A25/2C25	11	5	B04A75			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
BC2-2B04/2D04	11	B04-1B35/1D35	11	5	B04B35			A
BC2-2B07/2D07	11	B04-2B07/2D07	11	4	B04B57			A
BC2-2B08/2D08	11	B04-2B08/2D08	11	4	B04B58			A
BC2-2B09/2D09	11	B04-2B09/2D09	11	4	B04B59			A
BC2-2B10/2D10	11	B04-2B10/2D10	11	4	B04B60			A
BC2-2B11/2D11	11	B04-2B11/2D11	11	4	B04B61			A
BC2-2B12/2D12	11	B04-2B12/2D12	11	4	B04B62			A
BC2-2B13/2D13	11	B04-2B13/2D13	11	4	B04B63			A
BC2-2B14/2D14	11	B04-2B14/2D14	11	4	B04B64			A
BC2-2B15/2D15	11	B04-1A35/1C35	11	6	B04A35			A
BC2-2B16/2D16	11	B05-1B36/1D36	11	7	B02B66			A
BC2-2B17/2D17	11	B05-2B18/2D18	11	4	B05B68			A
BC2-2B18/2D18	11	B04-2A22/2C22	11	4	B04A72			A
BC2-2B19/2D19	11	B14-1B37/1D37	11	11	B14B37			A
BC2-2B27/2D27	11	B05-2A04/2C04	11	5	B02B77			A
BC2-2B28/2D28	11	B05-2B15/2D15	11	5	B14B54			A
BC2-2B29/2D29	11	B05-2B04/2D04	11	6	B02B79			A
BC2-2B30/2D30	11	B01-1B19/1D19	11	9	B01B19			A
BC2-2B31/2D31	11	B04-2B21/2D21	11	4	B04B71			A
BC2-2B32/2D32	11	B01-1B30/1D30	11	6	B01B30			A
BC2-2B32/2D32	22	B05-2B05/2D05	22	6	B01B30			A
BC2-2B33/2D33	11	B05-2B33/2D33	11	4	B05B83			A
BC2-2B34/2D34	11	B05-2B34/2D34	11	4	B05B84			A
BC2-2B35/2D35	22	B05-2A05/2C05	22	6	B01A29			A
BC2-2B42/2D42	22	B05-1A36/1C36	22	9	B01A20			A
BC2-2B43/2D43	11	B05-1A35/1C35	11	9	B02B93			A

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PAGE    75  PACK       B04

     ORIGIN         LEVS       DESTINATION     LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B04-1A12/1C12   11         B05-1A40/1C40   11     5   B05A40                A

     B04-1A13/1C13   11         B04-1B34/1D34   11     5   B04B34                A

     B04-1A24/1C24   11         B02-1A24/1C24   11     4   B04A24                A
     B04-1A24/1C24   22         B05-1A24/1C24   22     3   B04A24                A

     B04-1A25/1C25   11         B02-1A25/1C25   11     4   B04A25                A
     B04-1A25/1C25   22         B05-1A25/1C25   22     3   B04A25                A

     B04-1A26/1C26   11         B02-1A26/1C26   11     4   B04A26                A
     B04-1A26/1C26   22         B05-1A26/1C26   22     3   B04A26                A

     B04-1A27/1C27   11         B02-1A27/1C27   11     4   B04A27                A
     B04-1A27/1C27   22         B05-1A27/1C27   22     3   B04A27                A

     B04-1A28/1C28   11         B02-1A28/1C28   11     4   B04A28                A
     B04-1A28/1C28   22         B05-1A28/1C28   22     3   B04A28                A

     B04-1A29/1C29   11         B02-1A29/1C29   11     4   B04A29                A
     B04-1A29/1C29   22         B05-1A29/1C29   22     3   B04A29                A

     B04-1A30/1C30   11         B02-1A30/1C30   11     4   B04A30                A
     B04-1A30/1C30   22         B05-1A30/1C30   22     3   B04A30                A

     B04-1A31/1C31   11         B02-1A31/1C31   11     4   B04A31                A
     B04-1A31/1C31   22         B05-1A31/1C31   22     3   B04A31                A

     B04-1A32/1C32   11         B05-2B29/2D29   11     8   B05B79                A

     B04-1A34/1C34   11         B05-1B22/1D22   11     4   B04A34                A

     B04-1A35/1C35   11         B02-2B15/2D15   11     6   B04A35                A

     B04-1A43/1C43   11         B05-1B38/1D38   11     3   B04A43                A

     B04-1B03/1D03   11         B04-2B24/2D24   11    10   B04B74                A

     B04-1B04/1D04   11         B01-1A04/1C04   11     4   B05B72                A
     B04-1B04/1D04   22         B04-2A34/2C34   22    11   B05B72                A

     B04-1B24/1D24   11         B02-1B24/1D24   11     4   B04B24                A
     B04-1B24/1D24   22         B05-1B24/1D24   22     3   B04B24                A

     B04-1B25/1D25   11         B02-1B25/1D25   11     4   B04B25                A
     B04-1B25/1D25   22         B05-1B25/1D25   22     3   B04B25                A

     B04-1B26/1D26   11         B02-1B26/1D26   11     4   B04B26                A
     B04-1B26/1D26   22         B05-1B26/1D26   22     3   B04B26                A

     B04-1B27/1D27   11         B02-1B27/1D27   11     4   B04B27                A
     B04-1B27/1D27   22         B05-1B27/1D27   22     3   B04B27                A
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PAGE     76  PACK        B04

     ORIGIN         LEVS        DESTINATION      LEVS  LTH     SIGNAL   CBL  COLORS   REV

     B04-1B28/1D28   11          B02-1B28/1D28   11      4     B04B28                   A
     B04-1B28/1D28   22          B05-1B28/1D28   22      3     B04B28                   A

     B04-1B29/1D29   11          B02-1B29/1D29   11      4     B04B29                   A
     B04-1B29/1D29   22          B05-1B29/1D29   22      3     B04B29                   A

     B04-1B30/1D30   11          B02-1B30/1D30   11      4     B04B30                   A
     B04-1B30/1D30   22          B05-1B30/1D30   22      3     B04B30                   A

     B04-1B31/1D31   11          B02-1B31/1D31   11      4     B04B31                   A
     B04-1B31/1D31   22          B05-1B31/1D31   22      3     B04B31                   A

     B04-1B33/1D33   11          B05-2A28/2C28   11      8     B04B33                   A

     B04-1B34/1D34   11          B04-1A13/1C13   11      5     B04B34                   A

     B04-1B35/1D35   11          B02-2B04/2D04   11      5     B04B35                   A

     B04-2A03/2C03   11          B05-2A13/2C13   11      4     B05A63                   A

     B04-2A05/2C05   11          B05-1A38/1C38   11      5     B04A55                   A

     B04-2A07/2C07   11          B02-2A07/2C07   11      4     B04A57                   A

     B04-2A08/2C08   11          B02-2A08/2C08   11      4     B04A58                   A

     B04-2A09/2C09   11          B02-2A09/2C09   11      4     B04A59                   A

     B04-2A10/2C10   11          B02-2A10/2C10   11      4     B04A60                   A

     B04-2A11/2C11   11          B02-2A11/2C11   11      4     B04A61                   A

     B04-2A12/2C12   11          B02-2A12/2C12   11      4     B04A62                   A

     B04-2A13/2C13   11          B02-2A13/2C13   11      4     B04A63                   A

     B04-2A14/2C14   11          B02-2A14/2C14   11      4     B04A64                   A

     B04-2A17/2C17   11          B05-1A42/1C42   11      6     B05A42                   A

     B04-2A20/2C20   11          B05-2A25/2C25   11      3     B04A70                   A

     B04-2A21/2C21   11          B05-1B34/1D34   11      7     B04A71                   A

     B04-2A22/2C22   11          B02-2B18/2D18   11      4     B04A72                   A

     B04-2A25/2C25   11          B02-2A43/2C43   11      5     B04A75                   A

     B04-2A26/2C26   11          B01-2B14/2D14   11      4     B04A76                   A

     B04-2A27/2C27   11          B05-2A18/2C18   11      4     B04A77                   A

     B04-2A30/2C30   11          B05-2A30/2C30   11      3     B05A80                   A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B04-2A31/2C31	11	B05-2A31/2C31	11	3	B05A81			A
B04-2A32/2C32	11	B05-1B41/1D41	11	7	B05B41			A
B04-2A33/2C33	11	B05-1B17/1D17	11	10	B04A83			A
B04-2A34/2C34	11	B05-2B22/2D22	11	4	B05B72			A
B04-2A34/2C34	22	B04-1B04/1D04	22	11	B05B72			A
B04-2A35/2C35	22	B05-2A35/2C35	22	3	B05A85			A
B04-2A36/2C36	22	B05-2A36/2C36	22	3	B05A86			A
B04-2A37/2C37	22	B05-2A37/2C37	22	3	B05A87			A
B04-2A38/2C38	22	B05-2A38/2C38	22	3	B05A88			A
B04-2A40/2C40	22	B05-2A40/2C40	22	3	B05A90			A
B04-2A41/2C41	22	B05-2A41/2C41	22	3	B05A91			A
B04-2A42/2C42	22	B05-2A42/2C42	22	3	B05A92			A
B04-2A43/2C43	22	B05-2A43/2C43	22	3	B05A93			A
B04-2B07/2D07	11	B02-2B07/2D07	11	4	B04B57			A
B04-2B08/2D08	11	B02-2B08/2D08	11	4	B04B58			A
B04-2B09/2D09	11	B02-2B09/2D09	11	4	B04B59			A
B04-2B10/2D10	11	B02-2B10/2D10	11	4	B04B60			A
B04-2B11/2D11	11	B02-2B11/2D11	11	4	B04B61			A
B04-2B12/2D12	11	B02-2B12/2D12	11	4	B04B62			A
B04-2B13/2D13	11	B02-2B13/2D13	11	4	B04B63			A
B04-2B14/2D14	11	B02-2B14/2D14	11	4	B04B64			A
B04-2B20/2D20	11	B02-2A03/2C03	11	5	B04B70			A
B04-2B21/2D21	11	B02-2B31/2D31	11	4	B04B71			A
B04-2B22/2D22	11	B05-1A17/1C17	11	9	B04B72			A
B04-2B24/2D24	11	B04-1B03/1D03	11	10	B04B74			A
B04-2B25/2D25	11	B13-1B31/1D31	11	10	B04B75			A
B04-2B26/2D26	11	B05-2B24/2D24	11	3	B04B76			A
B04-2B27/2D27	11	B05-2A19/2C19	11	3	B04B77			A

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     ORIGIN          LEVS        DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS   REV

     B04-2B30/2D30   11          B05-2B30/2D30    11      3    B05B80                   A

     B04-2B31/2D31   22          B05-2B31/2D31    22      3    B05B81                   A

     B04-2B33/2D33   11          B05-2B12/2D12    11      5    B04B83                   A

     B04-2B34/2D34   11          B02-2A26/2C26    11      4    B04B84                   A
     B04-2B34/2D34   22          B05-2A09/2C09    22      5    B04B84                   A

     B04-2B35/2D35   22          B05-2B35/2D35    22      3    B05B85                   A

     B04-2B36/2D36   22          B05-2B36/2D36    22      3    B05B86                   A

     B04-2B37/2D37   22          B05-2B37/2D37    22      3    B05B87                   A

     B04-2B38/2D38   22          B05-2B38/2D38    22      3    B05B88                   A

     B04-2B40/2D40   22          B05-2B40/2D40    22      3    B05B90                   A

     B04-2B41/2D41   22          B05-2B41/2D41    22      3    B05B91                   A

     B04-2B42/2D42   22          B05-2B42/2D42    22      3    B05B92                   A

     B04-2B43/2D43   22          B05-2B43/2D43    22      3    B05B93                   A
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PAGE    79  PACK         B05

     ORIGIN          LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL   COLORS   REV


     B05-1A03/1C03   11         B02-1A03/1C03    11      4   B05A03                    A
     B05-1A03/1C03   22         B07-1A03/1C03    22      4   B05A03                    A

     B05-1A04/1C04   11         B07-1A04/1C04    11      4   B05A04                    A
     B05-1A04/1C04   22         B02-1A04/1C04    22      4   B05A04                    A

     B05-1A05/1C05   11         B02-1A05/1C05    11      4   B05A05                    A
     B05-1A05/1C05   22         B07-1A05/1C05    22      4   B05A05                    A

     B05-1A07/1C07   11         B02-1A07/1C07    11      4   B05A07                    A
     B05-1A07/1C07   22         B07-1A07/1C07    22      4   B05A07                    A

     B05-1A08/1C08   11         B07-1A08/1C08    11      4   B05A08                    A
     B05-1A08/1C08   22         B02-1A08/1C08    22      4   B05A08                    A

     B05-1A09/1C09   11         B07-1A09/1C09    11      4   B05A09                    A
     B05-1A09/1C09   22         B02-1A09/1C09    22      4   B05A09                    A

     B05-1A10/1C10   11         B07-1A10/1C10    11      4   B05A10                    A
     B05-1A10/1C10   22         B02-1A10/1C10    22      4   B05A10                    A

     B05-1A11/1C11   11         B07-1A11/1C11    11      4   B05A11                    A
     B05-1A11/1C11   22         B02-1A11/1C11    22      4   B05A11                    A

     B05-1A12/1C12   11         B07-1A12/1C12    11      4   B05A12                    A
     B05-1A12/1C12   22         B02-1A12/1C12    22      4   B05A12                    A

     B05-1A13/1C13   11         B07-1A13/1C13    11      4   B05A13                    A
     B05-1A13/1C13   22         B02-1A13/1C13    22      4   B05A13                    A

     B05-1A14/1C14   11         B07-1A14/1C14    11      4   B05A14                    A
     B05-1A14/1C14   22         B02-1A14/1C14    22      4   B05A14                    A

     B05-1A15/1C15   11         B07-1A15/1C15    11      4   B05A15                    A
     B05-1A15/1C15   22         B02-1A15/1C15    22      4   B05A15                    A

     B05-1A16/1C16   11         B07-1A16/1C16    11      4   B05A16                    A
     B05-1A16/1C16   22         B02-1A16/1C16    22      4   B05A16                    A

     B05-1A17/1C17   11         B04-2B22/2D22    11      9   B04B72                    A

     B05-1A22/1C22   22         B15-2B19/2D19    22     11   B15B69                    A

     B05-1A24/1C24   22         B04-1A24/1C24    22      3   B04A24                    A

     B05-1A25/1C25   22         B04-1A25/1C25    22      3   B04A25                    A

     B05-1A26/1C26   22         B04-1A26/1C26    22      3   B04A26                    A

     B05-1A27/1C27   22         B04-1A27/1C27    22      3   B04A27                    A

     B05-1A28/1C28   22         B04-1A28/1C28    22      3   B04A28                    A
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PAGE    80  PACK        B05

     ORIGIN         LEVS      DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS   REV

     B05-1A29/1C29   22         B04-1A29/1C29   22     3   B04A29                   A

     B05-1A30/1C30   22         B04-1A30/1C30   22     3   B04A30                   A

     B05-1A31/1C31   22         B04-1A31/1C31   22     3   B04A31                   A

     B05-1A33/1C33   11         B01-1A22/1C22   11     5   B05A33                   A

     B05-1A34/1C34   11         B01-1A35/1C35   11     5   B02A74                   A
     B05-1A34/1C34   22         B02-2A24/2C24   22     7   B02A74                   A

     B05-1A35/1C35   11         B02-2B43/2D43   11     9   B02B93                   A

     B05-1A36/1C36   11         B01-1A20/1C20   11     5   B01A20                   A
     B05-1A36/1C36   22         B02-2B42/2D42   22     9   B01A20                   A

     B05-1A38/1C38   11         B04-2A05/2C05   11     5   B04A55                   A

     B05-1A40/1C40   11         B04-1A12/1C12   11     5   B05A40                   A

     B05-1A41/1C41   11         B01-1B04/1D04   11     7   B01B04                   A

     B05-1A42/1C42   11         B04-2A17/2C17   11     6   B05A42                   A

     B05-1A43/1C43   11         B02-2A22/2C22   11     6   B05A43                   A

     B05-1B03/1D03   11         B02-1B03/1D03   11     4   B05B03                   A
     B05-1B03/1D03   22         B07-1B03/1D03   22     4   B05B03                   A

     B05-1B04/1D04   11         B07-1B04/1D04   11     4   B05B04                   A

     B05-1B05/1D05   11         B07-1B05/1D05   11     4   B05B05                   A

     B05-1B08/1D08   11         B07-1B08/1D08   11     4   B05B08                   A
     B05-1B08/1D08   22         B02-1B08/1D08   22     4   B05B08                   A

     B05-1B09/1D09   11         B07-1B09/1D09   11     4   B05B09                   A
     B05-1B09/1D09   22         B02-1B09/1D09   22     4   B05B09                   A

     B05-1B10/1D10   11         B07-1B10/1D10   11     4   B05B10                   A
     B05-1B10/1D10   22         B02-1B10/1D10   22     4   B05B10                   A

     B05-1B11/1D11   11         B07-1B11/1D11   11     4   B05B11                   A
     B05-1B11/1D11   22         B02-1B11/1D11   22     4   B05B11                   A

     B05-1B12/1D12   11         B07-1B12/1D12   11     4   B05B12                   A
     B05-1B12/1D12   22         B02-1B12/1D12   22     4   B05B12                   A

     B05-1B13/1D13   11         B07-1B13/1D13   11     4   B05B13                   A
     B05-1B13/1D13   22         B02-1B13/1D13   22     4   B05B13                   A

     B05-1B14/1D14   11         B07-1B14/1D14   11     4   B05B14                   A
     B05-1B14/1D14   22         B02-1B14/1D14   22     4   B05B14                   A
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    ORIGIN        LEVS     DESTINATION      LEVS  LTH    SIGNAL  CBL   COLORS   REV

    B05-1B15/1D15  11        B07-1B15/1D15   11     4    B05B15                  A
    B05-1B15/1D15  22        B02-1B15/1D15   22     4    B05B15                  A

    B05-1B16/1D16  11        B07-1B16/1D16   11     4    B05B16                  A
    B05-1B16/1D16  22        B02-1B16/1D16   22     4    B05B16                  A

    B05-1B17/1D17  11        B04-2A33/2C33   11    10    B04A83                  A

    B05-1B22/1D22  11        B04-1A34/1C34   11     4    B04A34                  A

    B05-1B24/1D24  22        B04-1B24/1D24   22     3    B04B24                  A

    B05-1B25/1D25  22        B04-1B25/1D25   22     3    B04B25                  A

    B05-1B26/1D26  22        B04-1B26/1D26   22     3    B04B26                  A

    B05-1B27/1D27  22        B04-1B27/1D27   22     3    B04B27                  A

    B05-1B28/1D28  22        B04-1B28/1D28   22     3    B04B28                  A

    B05-1B29/1D29  22        B04-1B29/1D29   22     3    B04B29                  A

    B05-1B30/1D30  22        B04-1B30/1D30   22     3    B04B30                  A

    B05-1B31/1D31  22        B04-1B31/1D31   22     3    B04B31                  A

    B05-1B32/1D32  11        B16-2B26/2D26   11    11    B05B32                  A

    B05-1B34/1D34  11        B04-2A21/2C21   11     7    B04A71                  A

    B05-1B35/1D35  22        B02-2A41/2C41   22     9    B01B29                  A

    B05-1B36/1D36  11        B02-2B16/2D16   11     7    B02B66                  A

    B05-1B38/1D38  11        B04-1A43/1C43   11     3    B04A43                  A

    B05-1B40/1D40  11        B13-1A34/1C34   11     7    B13A34                  A

    B05-1B41/1D41  11        B04-2A32/2C32   11     7    B05B41                  A

    B05-1B42/1D42  11        B02-1A19/1C19   11     6    B02A19                  A

    B05-1B43/1D43  11        B01-1B03/1D03   11     7    B01B03                  A

    B05-2A03/2C03  11        B02-2A25/2C25   11     5    B05A53                  A

    B05-2A04/2C04  11        B02-2B27/2D27   11     5    B02B77                  A

    B05-2A05/2C05  11        B01-1A29/1C29   11     6    B01A29                  A
    B05-2A05/2C05  22        B02-2B35/2D35   22     6    B01A29                  A

    B05-2A07/2C07  11        B01-1B14/1D14   11     8    B01B14                  A

    B05-2A08/2C08  11        B01-1A14/1C14   11     8    B01A14                  A
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ORIGIN          LEVS      DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

B05-2A09/2C09   11        B14-2B16/2D16    11      8   B04B84                A
B05-2A09/2C09   22        B04-2B34/2D34    22      5   B04B84                A

B05-2A13/2C13   11        B04-2A03/2C03    11      4   B05A63                A

B05-2A14/2C14   11        B02-1A21/1C21    11      8   B05A64                A

B05-2A15/2C15   11        B02-2A40/2C40    11      6   B05A65                A

B05-2A17/2C17   11        B09-2B14/2D14    11      5   B09B64                A

B05-2A18/2C18   11        B04-2A27/2C27    11      4   B04A77                A

B05-2A19/2C19   11        B04-2B27/2D27    11      3   B04B77                A

B05-2A20/2C20   11        B02-2A37/2C37    11      5   B05A70                A

B05-2A21/2C21   11        B01-2B13/2D13    11      5   B01B63                A

B05-2A22/2C22   11        B13-1A38/1C38    11      9   B13A38                A

B05-2A24/2C24   22        B02-2A38/2C38    22      5   B05A74                A

B05-2A25/2C25   11        B04-2A20/2C20    11      3   B04A70                A

B05-2A26/2C26   11        B02-2A20/2C20    11      4   B02A70                A

B05-2A27/2C27   11        B01-2A09/2C09    11      5   B01A59                A

B05-2A28/2C28   11        B04-1B33/1D33    11      8   B04B33                A

B05-2A30/2C30   11        B04-2A30/2C30    11      3   B05A80                A
B05-2A30/2C30   22        B07-2A30/2C30    22      4   B05A80                A

B05-2A31/2C31   11        B04-2A31/2C31    11      3   B05A81                A
B05-2A31/2C31   22        B07-2A31/2C31    22      4   B05A81                A

B05-2A34/2C34   11        B02-2A34/2C34    11      4   B05A84                A
B05-2A34/2C34   22        B07-2A34/2C34    22      4   B05A84                A

B05-2A35/2C35   11        B07-2A35/2C35    11      4   B05A85                A
B05-2A35/2C35   22        B04-2A35/2C35    22      3   B05A85                A

B05-2A36/2C36   11        B07-2A36/2C36    11      4   B05A86                A
B05-2A36/2C36   22        B04-2A36/2C36    22      3   B05A86                A

B05-2A37/2C37   11        B07-2A37/2C37    11      4   B05A87                A
B05-2A37/2C37   22        B04-2A37/2C37    22      3   B05A87                A

B05-2A38/2C38   11        B07-2A38/2C38    11      4   B05A88                A
B05-2A38/2C38   22        B04-2A38/2C38    22      3   B05A88                A

B05-2A40/2C40   11        B07-2A40/2C40    11      4   B05A90                A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B05-2A40/2C40	22	B04-2A40/2C40	22	3	B05A90			A
B05-2A41/2C41	11	B07-2A41/2C41	11	4	B05A91			A
B05-2A41/2C41	22	B04-2A41/2C41	22	3	B05A91			A
B05-2A42/2C42	11	B07-2A42/2C42	11	4	B05A92			A
B05-2A42/2C42	22	B04-2A42/2C42	22	3	B05A92			A
B05-2A43/2C43	11	B07-2A43/2C43	11	4	B05A93			A
B05-2A43/2C43	22	B04-2A43/2C43	22	3	B05A93			A
B05-2B03/2D03	11	B01-1A03/1C03	11	9	B05B53			A
B05-2B04/2D04	11	B02-2B29/2D29	11	6	B02B79			A
B05-2B04/2D04	22	B14-1A40/1C40	22	8	B02B79			A
B05-2B05/2D05	22	B02-2B32/2D32	22	6	B01B30			A
B05-2B07/2D07	11	B02-1A35/1C35	11	6	B05B57			A
B05-2B08/2D08	11	B14-1B35/1D35	11	9	B14B35			A
B05-2B10/2D10	11	B01-2A04/2C04	11	5	B05B60			A
B05-2B12/2D12	11	B04-2B33/2D33	11	5	B04B83			A
B05-2B15/2D15	11	B02-2B28/2D28	11	5	B14B54			A
B05-2B15/2D15	22	B14-2B04/2D04	22	8	B14B54			A
B05-2B16/2D16	11	B01-1B22/1D22	11	8	B05B66			A
B05-2B17/2D17	11	B01-1A19/1C19	11	8	B05B67			A
B05-2B18/2D18	11	B02-2B17/2D17	11	4	B05B68			A
B05-2B22/2D22	11	B04-2A34/2C34	11	4	B05B72			A
B05-2B24/2D24	11	B04-2B26/2D26	11	3	B04B76			A
B05-2B25/2D25	11	B01-2B10/2D10	11	5	B05B75			A
B05-2B29/2D29	11	B04-1A32/1C32	11	8	B05B79			A
B05-2B30/2D30	11	B04-2B30/2D30	11	3	B05B80			A
B05-2B30/2D30	22	B07-2B30/2D30	22	4	B05B80			A
B05-2B31/2D31	11	B07-2B31/2D31	11	4	B05B81			A
B05-2B31/2D31	22	B04-2B31/2D31	22	3	B05B81			A
B05-2B32/2D32	11	B07-2B32/2D32	11	4	B05B82			A
B05-2B33/2D33	11	B02-2B33/2D33	11	4	B05B83			A
B05-2B33/2D33	22	B07-2B33/2D33	22	4	B05B83			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B05-2B34/2D34	11	B02-2B34/2D34	11	4	B05B84			A
B05-2B34/2D34	22	B07-2B34/2D34	22	4	B05B84			A
B05-2B35/2D35	11	B07-2B35/2D35	11	4	B05B85			A
B05-2B35/2D35	22	B04-2B35/2D35	22	3	B05B85			A
B05-2B36/2D36	11	B07-2B36/2D36	11	4	B05B86			A
B05-2B36/2D36	22	B04-2B36/2D36	22	3	B05B86			A
B05-2B37/2D37	11	B07-2B37/2D37	11	4	B05B87			A
B05-2B37/2D37	22	B04-2B37/2D37	22	3	B05B87			A
B05-2B38/2D38	11	B07-2B38/2D38	11	4	B05B88			A
B05-2B38/2D38	22	B04-2B38/2D38	22	3	B05B88			A
B05-2B40/2D40	11	B07-2B40/2D40	11	4	B05B90			A
B05-2B40/2D40	22	B04-2B40/2D40	22	3	B05B90			A
B05-2B41/2D41	11	B07-2B41/2D41	11	4	B05B91			A
B05-2B41/2D41	22	B04-2B41/2D41	22	3	B05B91			A
B05-2B42/2D42	11	B07-2B42/2D42	11	4	B05B92			A
B05-2B42/2D42	22	B04-2B42/2D42	22	3	B05B92			A
B05-2B43/2D43	11	B07-2B43/2D43	11	4	B05B93			A
B05-2B43/2D43	22	B04-2B43/2D43	22	3	B05B93			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B07-1A03/1C03	11	B09-1A03/1C03	11	4	B05A03			A
B07-1A03/1C03	22	B05-1A03/1C03	22	4	B05A03			A
B07-1A04/1C04	11	B05-1A04/1C04	11	4	B05A04			A
B07-1A04/1C04	22	B09-1A04/1C04	22	4	B05A04			A
B07-1A05/1C05	11	B09-1A05/1C05	11	4	B05A05			A
B07-1A05/1C05	22	B05-1A05/1C05	22	4	B05A05			A
B07-1A07/1C07	11	B09-1A07/1C07	11	4	B05A07			A
B07-1A07/1C07	22	B05-1A07/1C07	22	4	B05A07			A
B07-1A08/1C08	11	B05-1A08/1C08	11	4	B05A08			A
B07-1A08/1C08	22	B08-1A08/1C08	22	3	B05A08			A
B07-1A09/1C09	11	B05-1A09/1C09	11	4	B05A09			A
B07-1A09/1C09	22	B08-1A09/1C09	22	3	B05A09			A
B07-1A10/1C10	11	B05-1A10/1C10	11	4	B05A10			A
B07-1A10/1C10	22	B08-1A10/1C10	22	3	B05A10			A
B07-1A11/1C11	11	B05-1A11/1C11	11	4	B05A11			A
B07-1A11/1C11	22	B08-1A11/1C11	22	3	B05A11			A
B07-1A12/1C12	11	B05-1A12/1C12	11	4	B05A12			A
B07-1A12/1C12	22	B08-1A12/1C12	22	3	B05A12			A
B07-1A13/1C13	11	B05-1A13/1C13	11	4	B05A13			A
B07-1A13/1C13	22	B08-1A13/1C13	22	3	B05A13			A
B07-1A14/1C14	11	B05-1A14/1C14	11	4	B05A14			A
B07-1A14/1C14	22	B08-1A14/1C14	22	3	B05A14			A
B07-1A15/1C15	11	B05-1A15/1C15	11	4	B05A15			A
B07-1A15/1C15	22	B08-1A15/1C15	22	3	B05A15			A
B07-1A16/1C16	11	B05-1A16/1C16	11	4	B05A16			A
B07-1A16/1C16	22	B08-1A16/1C16	22	3	B05A16			A
B07-1A17/1C17	11	B09-2A13/2C13	11	8	B07A17			A
B07-1A18/1C18	11	B08-2B26/2D26	11	9	B08B76			A
B07-1A19/1C19	11	B08-2B25/2D25	11	9	B08B75			A
B07-1B03/1D03	11	B09-1B03/1D03	11	4	B05B03			A
B07-1B03/1D03	22	B05-1B03/1D03	22	4	B05B03			A
B07-1B04/1D04	11	B05-1B04/1D04	11	4	B05B04			A
B07-1B04/1D04	22	B09-1B04/1D04	22	4	B05B04			A
B07-1B05/1D05	11	B05-1B05/1D05	11	4	B05B05			A
B07-1B05/1D05	22	B09-1B05/1D05	22	4	B05B05			A

ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B07-1B08/1D08	11	B05-1B08/1D08	11	4	B05B08			A
B07-1B08/1D08	22	B08-1B08/1D08	22	3	B05B08			A
B07-1B09/1D09	11	B05-1B09/1D09	11	4	B05B09			A
B07-1B09/1D09	22	B08-1B09/1D09	22	3	B05B09			A
B07-1B10/1D10	11	B05-1B10/1D10	11	4	B05B10			A
B07-1B10/1D10	22	B08-1B10/1D10	22	3	B05B10			A
B07-1B11/1D11	11	B05-1B11/1D11	11	4	B05B11			A
B07-1B11/1D11	22	B08-1B11/1D11	22	3	B05B11			A
B07-1B12/1D12	11	B05-1B12/1D12	11	4	B05B12			A
B07-1B12/1D12	22	B08-1B12/1D12	22	3	B05B12			A
B07-1B13/1D13	11	B05-1B13/1D13	11	4	B05B13			A
B07-1B13/1D13	22	B08-1B13/1D13	22	3	B05B13			A
B07-1B14/1D14	11	B05-1B14/1D14	11	4	B05B14			A
B07-1B14/1D14	22	B08-1B14/1D14	22	3	B05B14			A
B07-1B15/1D15	11	B05-1B15/1D15	11	4	B05B15			A
B07-1B15/1D15	22	B08-1B15/1D15	22	3	B05B15			A
B07-1B16/1D16	11	B05-1B16/1D16	11	4	B05B16			A
B07-1B16/1D16	22	B08-1B16/1D16	22	3	B05B16			A
B07-1B17/1D17	11	B09-2B13/2D13	11	8	B09B63			A
B07-1B18/1D18	11	B08-2A26/2C26	11	9	B08A76			A
B07-1B19/1D19	11	B08-2A25/2C25	11	9	B08A75			A
B07-2A14/2C14	11	B09-2A14/2C14	11	4	B07A64			A
B07-2A30/2C30	11	B09-2A30/2C30	11	4	B05A80			A
B07-2A30/2C30	22	B05-2A30/2C30	22	4	B05A80			A
B07-2A31/2C31	11	B09-2A31/2C31	11	4	B05A81			A
B07-2A31/2C31	22	B05-2A31/2C31	22	4	B05A81			A
B07-2A34/2C34	11	B08-2A34/2C34	11	3	B05A84			A
B07-2A34/2C34	22	B05-2A34/2C34	22	4	B05A84			A
B07-2A35/2C35	11	B05-2A35/2C35	11	4	B05A85			A
B07-2A35/2C35	22	B08-2A35/2C35	22	3	B05A85			A
B07-2A36/2C36	11	B05-2A36/2C36	11	4	B05A86			A
B07-2A36/2C36	22	B08-2A36/2C36	22	3	B05A86			A
B07-2A37/2C37	11	B05-2A37/2C37	11	4	B05A87			A
B07-2A37/2C37	22	B08-2A37/2C37	22	3	B05A87			A

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PAGE     87  PACK        B07

     ORIGIN          LEVS       DESTINATION       LEVS  LTH    SIGNAL   CBL  COLORS  REV

     B07-2A38/2C38   11         B05-2A38/2C38    11      4    B05A88                 A
     B07-2A38/2C38   22         B08-2A38/2C38    22      3    B05A88                 A

     B07-2A40/2C40   11         B05-2A40/2C40    11      4    B05A90                 A
     B07-2A40/2C40   22         B08-2A40/2C40    22      3    B05A90                 A

     B07-2A41/2C41   11         B05-2A41/2C41    11      4    B05A91                 A
     B07-2A41/2C41   22         B08-2A41/2C41    22      3    B05A91                 A

     B07-2A42/2C42   11         B05-2A42/2C42    11      4    B05A92                 A
     B07-2A42/2C42   22         B08-2A42/2C42    22      3    B05A92                 A

     B07-2A43/2C43   11         B05-2A43/2C43    11      4    B05A93                 A
     B07-2A43/2C43   22         B08-2A43/2C43    22      3    B05A93                 A

     B07-2B30/2D30   11         B09-2B30/2D30    11      4    B05B80                 A
     B07-2B30/2D30   22         B05-2B30/2D30    22      4    B05B80                 A

     B07-2B31/2D31   11         B05-2B31/2D31    11      4    B05B81                 A
     B07-2B31/2D31   22         B09-2B31/2D31    22      4    B05B81                 A

     B07-2B32/2D32   11         B05-2B32/2D32    11      4    B05B82                 A
     B07-2B32/2D32   22         B09-2B32/2D32    22      4    B05B82                 A

     B07-2B33/2D33   11         B08-2B33/2D33    11      3    B05B83                 A
     B07-2B33/2D33   22         B05-2B33/2D33    22      4    B05B83                 A

     B07-2B34/2D34   11         B08-2B34/2D34    11      3    B05B84                 A
     B07-2B34/2D34   22         B05-2B34/2D34    22      4    B05B84                 A

     B07-2B35/2D35   11         B05-2B35/2D35    11      4    B05B85                 A
     B07-2B35/2D35   22         B08-2B35/2D35    22      3    B05B85                 A

     B07-2B36/2D36   11         B05-2B36/2D36    11      4    B05B86                 A
     B07-2B36/2D36   22         B08-2B36/2D36    22      3    B05B66                 A

     B07-2B37/2D37   11         B05-2B37/2D37    11      4    B05B87                 A
     B07-2B37/2D37   22         B08-2B37/2D37    22      3    B05B87                 A

     B07-2B38/2D38   11         B05-2B38/2D38    11      4    B05B88                 A
     B07-2B38/2D38   22         B08-2B38/2D38    22      3    B05B88                 A

     B07-2B40/2D40   11         B05-2B40/2D40    11      4    B05B90                 A
     B07-2B40/2D40   22         B08-2B40/2D40    22      3    B05B90                 A

     B07-2B41/2D41   11         B05-2B41/2D41    11      4    B05B91                 A
     B07-2B41/2D41   22         B08-2B41/2D41    22      3    B05B91                 A

     B07-2B42/2D42   11         B05-2B42/2D42    11      4    B05B92                 A
     B07-2B42/2D42   22         B08-2B42/2D42    22      3    B05B92                 A

     B07-2B43/2D43   11         B05-2B43/2D43    11      4    B05B93                 A
     B07-2B43/2D43   22         B08-2B43/2D43    22      3    B05B93                 A
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ORIGIN          LEVS      DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV

B08-1A07/1C07   11         B09-1B10/1D10   11     3    B09B10                 A

B08-1A08/1C08   11         B10-1A08/1C08   11     4    B05A08                 A
B08-1A08/1C08   22         B07-1A08/1C08   22     3    B05A08                 A

B08-1A09/1C09   11         B10-1A09/1C09   11     4    B05A09                 A
B08-1A09/1C09   22         B07-1A09/1C09   22     3    B05A09                 A

B08-1A10/1C10   11         B10-1A10/1C10   11     4    B05A10                 A
B08-1A10/1C10   22         B07-1A10/1C10   22     3    B05A10                 A

B08-1A11/1C11   11         B10-1A11/1C11   11     4    B05A11                 A
B08-1A11/1C11   22         B07-1A11/1C11   22     3    B05A11                 A

B08-1A12/1C12   11         B10-1A12/1C12   11     4    B05A12                 A
B08-1A12/1C12   22         B07-1A12/1C12   22     3    B05A12                 A

B08-1A13/1C13   11         B10-1A13/1C13   11     4    B05A13                 A
B08-1A13/1C13   22         B07-1A13/1C13   22     3    B05A13                 A

B08-1A14/1C14   11         B10-1A14/1C14   11     4    B05A14                 A
B08-1A14/1C14   22         B07-1A14/1C14   22     3    B05A14                 A

B08-1A15/1C15   11         B10-1A15/1C15   11     4    B05A15                 A
B08-1A15/1C15   22         B07-1A15/1C15   22     3    B05A15                 A

B08-1A16/1C16   11         B10-1A16/1C16   11     4    B05A16                 A
B08-1A16/1C16   22         B07-1A16/1C16   22     3    B05A16                 A

B08-1A17/1C17   11         B09-1A17/1C17   11     3    B09A17                 A

B08-1A18/1C18   11         B09-1A18/1C18   11     3    B09A18                 A

B08-1A19/1C19   11         B09-1A19/1C19   11     3    B09A19                 A

B08-1A20/1C20   11         B09-1A20/1C20   11     3    B08A20                 A

B08-1A21/1C21   11         B09-1A21/1C21   11     3    B09A21                 A

B08-1A22/1C22   11         B09-1A22/1C22   11     3    B09A22                 A

B08-1A24/1C24   11         B09-1A24/1C24   11     3    B09A24                 A

B08-1A25/1C25   11         B09-1A25/1C25   11     3    B09A25                 A

B08-1A26/1C26   11         B09-1A26/1C26   11     3    B09A26                 A

B08-1A27/1C27   11         B09-1A27/1C27   11     3    B09A27                 A

B08-1A28/1C28   11         B09-1A28/1C28   11     3    B09A28                 A

B08-1A29/1C29   11         B09-1A29/1C29   11     3    B09A29                 A
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PAGE     89  PACK         B08
     ORIGIN          LEVS       DESTINATION       LEVS   LTH    SIGNAL    CBL   COLORS   REV

     B08-1A30/1C30   11           B09-1A30/1C30   11       3    B08A30                    A

     B08-1A31/1C31   11           B09-1A31/1C31   11       3    B08A31                    A

     B08-1A32/1C32   11           B09-1A32/1C32   11       3    B08A32                    A

     B08-1A33/1C33   11           B09-1A33/1C33   11       3    B08A33                    A

     B08-1A34/1C34   11           B09-1A34/1C34   11       3    B08A34                    A

     B08-1A35/1C35   11           B09-1A35/1C35   11       3    B08A35                    A

     B08-1A36/1C36   11           B09-1A36/1C36   11       3    B08A36                    A

     B08-1A37/1C37   11           B09-1A37/1C37   11       3    B08A37                    A

     B08-1A38/1C38   11           B09-1A38/1C38   11       3    B08A38                    A

     B08-1A40/1C40   11           B09-1A40/1C40   11       3    B09A40                    A

     B08-1A41/1C41   11           B09-1A41/1C41   11       3    B09A41                    A

     B08-1A42/1C42   11           B09-1A42/1C42   11       3    B08A42                    A

     B08-1A43/1C43   11           B09-1A43/1C43   11       3    B09A43                    A

     B08-1B08/1D08   11           B10-1B08/1D08   11       4    B05B08                    A
     B08-1B08/1D08   22           B07-1B08/1D08   22       3    B05B08                    A

     B08-1B09/1D09   11           B10-1B09/1D09   11       4    B05B09                    A
     B08-1B09/1D09   22           B07-1B09/1D09   22       3    B05B09                    A

     B08-1B10/1D10   11           B10-1B10/1D10   11       4    B05B10                    A
     B08-1B10/1D10   22           B07-1B10/1D10   22       3    B05B10                    A

     B08-1B11/1D11   11           B10-1B11/1D11   11       4    B05B11                    A
     B08-1B11/1D11   22           B07-1B11/1D11   22       3    B05B11                    A

     B08-1B12/1D12   11           B10-1B12/1D12   11       4    B05B12                    A
     B08-1B12/1D12   22           B07-1B12/1D12   22       3    B05B12                    A

     B08-1B13/1D13   11           B10-1B13/1D13   11       4    B05B13                    A
     B08-1B13/1D13   22           B07-1B13/1D13   22       3    B05B13                    A

     B08-1B14/1D14   11           B10-1B14/1D14   11       4    B05B14                    A
     B08-1B14/1D14   22           B07-1B14/1D14   22       3    B05B14                    A

     B08-1B15/1D15   11           B10-1B15/1D15   11       4    B05B15                    A
     B08-1B15/1D15   22           B07-1B15/1D15   22       3    B05B15                    A

     B08-1B16/1D16   11           B10-1B16/1D16   11       4    B05B16                    A
     B08-1B16/1D16   22           B07-1B16/1D16   22       3    B05B16                    A

     B08-1B17/1D17   11           B09-1B17/1D17   11       3    B09B17                    A
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PAGE    90  PACK        B08
    ORIGIN         LEVS      DESTINATION      LEVS  LTH    SIGNAL  CBL  COLORS  REV

    B08-1B18/1C18   11        B09-1B18/1D18   11     3    B09B18                 A
    B08-1B19/1C19   11        B09-1B19/1D19   11     3    B09B19                 A
    B08-1B20/1C20   11        B09-1B20/1D20   11     3    B08B20                 A
    B08-1B21/1C21   11        B09-1B21/1D21   11     3    B08B21                 A
    B08-1B22/1C22   11        B09-1B22/1D22   11     3    B09B22                 A
    B08-1B24/1C24   11        B09-1B24/1D24   11     3    B09B24                 A
    B08-1B25/1C25   11        B09-1B25/1D25   11     3    B09B25                 A
    B08-1B26/1C26   11        B09-1B26/1D26   11     3    B09B26                 A
    B08-1B27/1C27   11        B09-1B27/1D27   11     3    B09B27                 A
    B08-1B28/1C28   11        B09-1B28/1D28   11     3    B09B28                 A
    B08-1B29/1C29   11        B09-1B29/1D29   11     3    B09B29                 A
    B08-1B30/1C30   11        B09-1B30/1D30   11     3    B08B30                 A
    B08-1B31/1C31   11        B09-1B31/1D31   11     3    B08B31                 A
    B08-1B32/1C32   11        B09-1B32/1D32   11     3    B08B32                 A
    B08-1B33/1C33   11        B09-1B33/1D33   11     3    B08B33                 A
    B08-1B34/1C34   11        B09-1B34/1D34   11     3    B08B34                 A
    B08-1B35/1C35   11        B09-1B35/1D35   11     3    B08B35                 A
    B08-1B36/1C36   11        B09-1B36/1D36   11     3    B08B36                 A
    B08-1B37/1C37   11        B09-1B37/1D37   11     3    B08B37                 A
    B08-1B38/1C38   11        B09-1B38/1D38   11     3    B08B38                 A
    B08-1B40/1C40   11        B09-1B40/1D40   11     3    B09B40                 A
    B08-1B41/1C41   11        B09-1B41/1D41   11     3    B09B41                 A
    B08-1B42/1C42   11        B09-1B42/1D42   11     3    B08B42                 A
    B08-1B43/1C43   11        B09-1B43/1D43   11     3    B09B43                 A
    B08-2A03/2C03   11        B09-2A03/2C03   11     3    B09A53                 A
    B08-2A04/2C04   11        B09-2A04/2C04   11     3    B09A54                 A
    B08-2A05/2C05   11        B09-2A05/2C05   11     3    B09A55                 A
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PAGE    91  PACK         B08
     ORIGIN        LEVS       DESTINATION      LEVS  LTH    SIGNAL  CBL  COLORS  REV


     B08-2A07/2C07  11         B09-2A07/2C07  11      3    B09A57                 A

     B08-2A08/2C08  11         B09-2A08/2C08  11      3    B09A58                 A

     B08-2A09/2C09  11         B09-2A09/2C09  11      3    B08A59                 A

     B08-2A10/2C10  11         B09-2A10/2C10  11      3    B09A60                 A

     B08-2A11/2C11  11         B09-2A11/2C11  11      3    B09A61                 A

     B08-2A12/2C12  11         B09-2A12/2C12  11      3    B08A62                 A

     B08-2A13/2C13  11         B08-2B13/2D13  11      3    B14B38                 A

     B08-2A14/2C14  11         B08-2B14/2D14  11      3    B14B38                 A
     B08-2A14/2C14  22         B08-2B13/2D13  22      3    B14B38                 A

     B08-2A15/2C15  11         B08-2B15/2D15  11      3    B14B38                 A
     B08-2A15/2C15  22         B08-2B14/2D14  22      3    B14B38                 A

     B08-2A16/2C16  11         B08-2B16/2D16  11      3    B14B38                 A
     B08-2A16/2C16  22         B08-2B15/2D15  22      3    B14B38                 A

     B08-2A17/2C17  11         B08-2B17/2D17  11      3    B14B38                 A
     B08-2A17/2C17  22         B08-2B16/2D16  22      3    B14B38                 A

     B08-2A18/2C18  11         B08-2B18/2D18  11      3    B14B38                 A
     B08-2A18/2C18  22         B08-2B17/2D17  22      3    B14B38                 A

     B08-2A19/2C19  11         B08-2B19/2D19  11      3    B14B38                 A
     B08-2A19/2C19  22         B08-2B18/2D18  22      3    B14B38                 A

     B08-2A20/2C20  11         B08-2B20/2D20  11      3    B14B38                 A
     B08-2A20/2C20  22         B08-2B19/2D19  22      3    B14B38                 A

     B08-2A21/2C21  11         B09-2A21/2C21  11      3    B09A71                 A

     B08-2A22/2C22  11         B09-2A22/2C22  11      3    B09A72                 A

     B08-2A24/2C24  11         B09-2A24/2C24  11      3    B09A74                 A

     B08-2A25/2C25  11         B07-1B19/1D19  11      9    B08A75                 A

     B08-2A26/2C26  11         B07-1B18/1D18  11      9    B08A76                 A

     B08-2A27/2C27  11         B09-2A27/2C27  11      3    B09A77                 A

     B08-2A28/2C28  11         B09-2A28/2C28  11      3    B09A78                 A

     B08-2A33/2C33  11         B09-1A10/1C10  11     10    B09A10                 A

     B08-2A34/2C34  11         B07-2A34/2C34  11      3    B05A84                 A
     B08-2A34/2C34  22         B10-2A34/2C34  22      4    B05A84                 A
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PAGE    92  PACK        B08

     ORIGIN          LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV


     B08-2A35/2C35   11          B10-2A35/2C35   11      4   B05A85                  A
     B08-2A35/2C35   22          B07-2A35/2C35   22      3   B05A85                  A

     B08-2A36/2C36   11          B10-2A36/2C36   11      4   B05A86                  A
     B08-2A36/2C36   22          B07-2A36/2C36   22      3   B05A86                  A

     B08-2A37/2C37   11          B10-2A37/2C37   11      4   B05A87                  A
     B08-2A37/2C37   22          B07-2A37/2C37   22      3   B05A87                  A

     B08-2A38/2C38   11          B10-2A38/2C38   11      4   B05A88                  A
     B08-2A38/2C38   22          B07-2A38/2C38   22      3   B05A88                  A

     B08-2A40/2C40   11          B10-2A40/2C40   11      4   B05A90                  A
     B08-2A40/2C40   22          B07-2A40/2C40   22      3   B05A90                  A

     B08-2A41/2C41   11          B10-2A41/2C41   11      4   B05A91                  A
     B08-2A41/2C41   22          B07-2A41/2C41   22      3   B05A91                  A

     B08-2A42/2C42   11          B10-2A42/2C42   11      4   B05A92                  A
     B08-2A42/2C42   22          B07-2A42/2C42   22      3   B05A92                  A

     B08-2A43/2C43   11          B10-2A43/2C43   11      4   B05A93                  A
     B08-2A43/2C43   22          B07-2A43/2C43   22      3   B05A93                  A

     B08-2B03/2D03   11          B09-2B03/2D03   11      3   B09B53                  A

     B08-2B04/2D04   11          B09-2B04/2D04   11      3   B09B54                  A

     B08-2B05/2D05   11          B09-2B05/2D05   11      3   B09B55                  A

     B08-2B07/2D07   11          B09-2B07/2D07   11      3   B09B57                  A

     B08-2B08/2D08   11          B09-2B08/2D08   11      3   B09B58                  A

     B08-2B09/2D09   11          B09-2B09/2D09   11      3   B08B59                  A

     B08-2B10/2D10   11          B09-2B10/2D10   11      3   B09B60                  A

     B08-2B11/2D11   11          B09-2B11/2D11   11      3   B09B61                  A

     B08-2B12/2D12   11          B09-2B12/2D12   11      3   B08B62                  A

     B08-2B13/2D13   11          B08-2A13/2C13   11      3   B14B38                  A
     B08-2B13/2D13   22          B08-2A14/2C14   22      3   B14B38                  A

     B08-2B14/2D14   11          B08-2A14/2C14   11      3   B14B38                  A
     B08-2B14/2D14   22          B08-2A15/2C15   22      3   B14B38                  A

     B08-2B15/2D15   11          B08-2A15/2C15   11      3   B14B38                  A
     B08-2B15/2D15   22          B08-2A16/2C16   22      3   B14B38                  A

     B08-2B16/2D16   11          B08-2A16/2C16   11      3   B14B38                  A
     B08-2B16/2D16   22          B08-2A17/2C17   22      3   B14B38                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B08-2B17/2D17	11	B08-2A17/2C17	11	3	B14B38			A
B08-2B17/2D17	22	B08-2A18/2C18	22	3	B14B38			A
B08-2B18/2D18	11	B08-2A18/2C18	11	3	B14B38			A
B08-2B18/2D18	22	B08-2A19/2C19	22	3	B14B38			A
B08-2B19/2D19	11	B08-2A19/2C19	11	3	B14B38			A
B08-2B19/2D19	22	B08-2A20/2C20	22	3	B14B38			A
B08-2B20/2D20	11	B08-2A20/2C20	11	3	B14B38			A
B08-2B20/2D20	22	B14-1B38/1D38	22	8	B14B38			A
B08-2B21/2D21	11	B09-2B21/2D21	11	3	B09B71			A
B08-2B22/2D22	11	B09-2B22/2D22	11	3	B09B72			A
B08-2B24/2D24	11	B09-2B24/2D24	11	3	B08B74			A
B08-2B25/2D25	11	B07-1A19/1C19	11	9	B08B75			A
B08-2B26/2D26	11	B07-1A18/1C18	11	9	B08B76			A
B08-2B27/2D27	11	B09-2B27/2D27	11	3	B09B77			A
B08-2B28/2D28	11	B09-2B28/2D28	11	3	B08B78			A
B08-2B33/2D33	11	B07-2B33/2D33	11	3	B05B83			A
B08-2B33/2D33	22	B10-2B33/2D33	22	4	B05B83			A
B08-2B34/2D34	11	B07-2B34/2D34	11	3	B05B84			A
B08-2B34/2D34	22	B10-2B34/2D34	22	4	B05B84			A
B08-2B35/2D35	11	B10-2B35/2D35	11	4	B05B85			A
B08-2B35/2D35	22	B07-2B35/2D35	22	3	B05B85			A
B08-2B36/2D36	11	B10-2B36/2D36	11	4	B05B86			A
B08-2B36/2D36	22	B07-2B36/2D36	22	3	B05B86			A
B08-2B37/2D37	11	B10-2B37/2D37	11	4	B05B87			A
B08-2B37/2D37	22	B07-2B37/2D37	22	3	B05B87			A
B08-2B38/2D38	11	B10-2B38/2D38	11	4	B05B88			A
B08-2B38/2D38	22	B07-2B38/2D38	22	3	B05B88			A
B08-2B40/2D40	11	B10-2B40/2D40	11	4	B05B90			A
B08-2B40/2D40	22	B07-2B40/2D40	22	3	B05B90			A
B08-2B41/2D41	11	B10-2B41/2D41	11	4	B05B91			A
B08-2B41/2D41	22	B07-2B41/2D41	22	3	B05B91			A
B08-2B42/2D42	11	B10-2B42/2D42	11	4	B05B92			A
B08-2B42/2D42	22	B07-2B42/2D42	22	3	B05B92			A

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PAGE    94  PACK        B08

     ORIGIN        LEVS      DESTINATION     LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B08-2B43/2D43  11         B10-2B43/2D43  11     4   B05B93                 A
     B08-2B43/2D43  22         B07-2B43/2D43  22     3   B05B93                 A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B09-1A03/1C03	11	B07-1A03/1C03	11	4	B05A03			A
B09-1A03/1C03	22	B14-1A03/1C03	22	5	B05A03			A
B09-1A04/1C04	11	B13-1A04/1C04	11	5	B05A04			A
B09-1A04/1C04	22	B07-1A04/1C04	22	4	B05A04			A
B09-1A05/1C05	11	B07-1A05/1C05	11	4	B05A05			A
B09-1A05/1C05	22	B17-1A05/1C05	22	7	B05A05			A
B09-1A07/1C07	11	B07-1A07/1C07	11	4	B05A07			A
B09-1A07/1C07	22	B10-1A07/1C07	22	3	B05A07			A
B09-1A10/1C10	11	B08-2A33/2C33	11	10	B09A10			A
B09-1A17/1C17	11	B08-1A17/1C17	11	3	B09A17			A
B09-1A18/1C18	11	B08-1A18/1C18	11	3	B09A18			A
B09-1A19/1C19	11	B08-1A19/1C19	11	3	B09A19			A
B09-1A20/1C20	11	B08-1A20/1C20	11	3	B08A20			A
B09-1A21/1C21	11	B08-1A21/1C21	11	3	B09A21			A
B09-1A22/1C22	11	B08-1A22/1C22	11	3	B09A22			A
B09-1A24/1C24	11	B08-1A24/1C24	11	3	B09A24			A
B09-1A25/1C25	11	B08-1A25/1C25	11	3	B09A25			A
B09-1A26/1C26	11	B08-1A26/1C26	11	3	B09A26			A
B09-1A27/1C27	11	B08-1A27/1C27	11	3	B09A27			A
B09-1A28/1C28	11	B08-1A28/1C28	11	3	B09A28			A
B09-1A29/1C29	11	B08-1A29/1C29	11	3	B09A29			A
B09-1A30/1C30	11	B08-1A30/1C30	11	3	B08A30			A
B09-1A31/1C31	11	B08-1A31/1C31	11	3	B08A31			A
B09-1A32/1C32	11	B08-1A32/1C32	11	3	B08A32			A
B09-1A33/1C33	11	B08-1A33/1C33	11	3	B08A33			A
B09-1A34/1C34	11	B08-1A34/1C34	11	3	B08A34			A
B09-1A35/1C35	11	B08-1A35/1C35	11	3	B08A35			A
B09-1A36/1C36	11	B08-1A36/1C36	11	3	B08A36			A
B09-1A37/1C37	11	B08-1A37/1C37	11	3	B08A37			A

ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B09-1A38/1C38	11	B08-1A38/1C38	11	3	B08A38			A
B09-1A40/1C40	11	B08-1A40/1C40	11	3	B09A40			A
B09-1A41/1C41	11	B08-1A41/1C41	11	3	B09A41			A
B09-1A42/1C42	11	B08-1A42/1C42	11	3	B08A42			A
B09-1A43/1C43	11	B08-1A43/1C43	11	3	B09A43			A
B09-1B03/1D03	11	B07-1B03/1D03	11	4	B05B03			A
B09-1B03/1D03	22	B13-1B03/1D03	22	5	B05B03			A
B09-1B04/1D04	11	B17-1B04/1D04	11	7	B05B04			A
B09-1B04/1D04	22	B07-1B04/1D04	22	4	B05B04			A
B09-1B05/1D05	11	B13-1B05/1D05	11	5	B05B05			A
B09-1B05/1D05	22	B07-1B05/1D05	22	4	B05B05			A
B09-1B10/1D10	11	B08-1A07/1C07	11	3	B09B10			A
B09-1B17/1D17	11	B08-1B17/1D17	11	3	B09B17			A
B09-1B18/1D18	11	B08-1B18/1D18	11	3	B09B18			A
B09-1B19/1D19	11	B08-1B19/1D19	11	3	B09B19			A
B09-1B20/1D20	11	B08-1B20/1D20	11	3	B08B20			A
B09-1B21/1D21	11	B08-1B21/1D21	11	3	B08B21			A
B09-1B22/1D22	11	B08-1B22/1D22	11	3	B09B22			A
B09-1B24/1D24	11	B08-1B24/1D24	11	3	B09B24			A
B09-1B25/1D25	11	B08-1B25/1D25	11	3	B09B25			A
B09-1B26/1D26	11	B08-1B26/1D26	11	3	B09B26			A
B09-1B27/1D27	11	B08-1B27/1D27	11	3	B09B27			A
B09-1B28/1D28	11	B08-1B28/1D28	11	3	B09B28			A
B09-1B29/1D29	11	B08-1B29/1D29	11	3	B09B29			A
B09-1B30/1D30	11	B08-1B30/1D30	11	3	B08B30			A
B09-1B31/1D31	11	B08-1B31/1D31	11	3	B08B31			A
B09-1B32/1D32	11	B08-1B32/1D32	11	3	B08B32			A
B09-1B33/1D33	11	B08-1B33/1D33	11	3	B08B33			A

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     ORIGIN        LEVS      DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B09-1B34/1D34  11        B08-1B34/1D34  11     3   B08B34                 A

     B09-1B35/1D35  11        B08-1B35/1D35  11     3   B08B35                 A

     B09-1B36/1D36  11        B08-1B36/1D36  11     3   B08B36                 A

     B09-1B37/1D37  11        B08-1B37/1D37  11     3   B08B37                 A

     B09-1B38/1D38  11        B08-1B38/1D38  11     3   B08B38                 A

     B09-1B40/1D40  11        B08-1B40/1D40  11     3   B09B40                 A

     B09-1B41/1D41  11        B08-1B41/1D41  11     3   B09B41                 A

     B09-1B42/1D42  11        B08-1B42/1D42  11     3   B08B42                 A

     B09-1B43/1D43  11        B08-1B43/1D43  11     3   B09B43                 A

     B09-2A03/2C03  11        B08-2A03/2C03  11     3   B09A53                 A

     B09-2A04/2C04  11        B08-2A04/2C04  11     3   B09A54                 A

     B09-2A05/2C05  11        B08-2A05/2C05  11     3   B09A55                 A

     B09-2A07/2C07  11        B08-2A07/2C07  11     3   B09A57                 A

     B09-2A08/2C08  11        B08-2A08/2C08  11     3   B09A58                 A

     B09-2A09/2C09  11        B08-2A09/2C09  11     3   B08A59                 A

     B09-2A10/2C10  11        B08-2A10/2C10  11     3   B09A60                 A

     B09-2A11/2C11  11        B08-2A11/2C11  11     3   B09A61                 A

     B09-2A12/2C12  11        B08-2A12/2C12  11     3   B08A62                 A

     B09-2A13/2C13  11        B07-1A17/1C17  11     8   B07A17                 A
     B09-2A13/2C13  22        B21-1A36/1C36  22    10   B07A17                 A

     B09-2A14/2C14  11        B07-2A14/2C14  11     4   B07A64                 A

     B09-2A21/2C21  11        B08-2A21/2C21  11     3   B09A71                 A

     B09-2A22/2C22  11        B08-2A22/2C22  11     3   B09A72                 A

     B09-2A24/2C24  11        B08-2A24/2C24  11     3   B09A74                 A

     B09-2A27/2C27  11        B08-2A27/2C27  11     3   B09A77                 A

     B09-2A28/2C28  11        B08-2A28/2C28  11     3   B09A78                 A

     B09-2A30/2C30  11        B07-2A30/2C30  11     4   B05A80                 A

     B09-2A31/2C31  11        B07-2A31/2C31  11     4   B05A81                 A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B09-2B03/2D03	11	B08-2B03/2D03	11	3	B09B53			A
B09-2B04/2D04	11	B08-2B04/2D04	11	3	B09B54			A
B09-2B05/2D05	11	B08-2B05/2D05	11	3	B09B55			A
B09-2B07/2D07	11	B08-2B07/2D07	11	3	B09B57			A
B09-2B08/2D08	11	B08-2B08/2D08	11	3	B09B58			A
B09-2B09/2D09	11	B08-2B09/2D09	11	3	B08B59			A
B09-2B10/2D10	11	B08-2B10/2D10	11	3	B09B60			A
B09-2B11/2D11	11	B08-2B11/2D11	11	3	B09B61			A
B09-2B12/2D12	11	B08-2B12/2D12	11	3	B08B62			A
B09-2B13/2D13	11	B07-1B17/1D17	11	8	B09B63			A
B09-2B13/2D13	22	B21-1B36/1D36	22	10	B09B63			A
B09-2B14/2D14	11	B05-2A17/2C17	11	5	B09B64			A
B09-2B21/2D21	11	B08-2B21/2D21	11	3	B09B71			A
B09-2B22/2D22	11	B08-2B22/2D22	11	3	B09B72			A
B09-2B24/2D24	11	B08-2B24/2D24	11	3	B08B74			A
B09-2B27/2D27	11	B08-2B27/2D27	11	3	B09B77			A
B09-2B28/2D28	11	B08-2B28/2D28	11	3	B08B78			A
B09-2B30/2D30	11	B07-2B30/2D30	11	4	B05B80			A
B09-2B31/2D31	11	B15-2B31/2D31	11	6	B05B81			A
B09-2B31/2D31	22	B07-2B31/2D31	22	4	B05B81			A
B09-2B32/2D32	22	B07-2B32/2D32	22	4	B05B82			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B10-1A07/1C07	11	B13-1A07/1C07	11	4	B05A07			A
B10-1A07/1C07	22	B09-1A07/1C07	22	3	B05A07			A
B10-1A08/1C08	11	B08-1A08/1C08	11	4	B05A08			A
B10-1A08/1C08	22	B13-1A08/1C08	22	4	B05A08			A
B10-1A09/1C09	11	B08-1A09/1C09	11	4	B05A09			A
B10-1A09/1C09	22	B13-1A09/1C09	22	4	B05A09			A
B10-1A10/1C10	11	B08-1A10/1C10	11	4	B05A10			A
B10-1A10/1C10	22	B13-1A10/1C10	22	4	B05A10			A
B10-1A11/1C11	11	B08-1A11/1C11	11	4	B05A11			A
B10-1A11/1C11	22	B13-1A11/1C11	22	4	B05A11			A
B10-1A12/1C12	11	B08-1A12/1C12	11	4	B05A12			A
B10-1A12/1C12	22	B13-1A12/1C12	22	4	B05A12			A
B10-1A13/1C13	11	B08-1A13/1C13	11	4	B05A13			A
B10-1A13/1C13	22	B13-1A13/1C13	22	4	B05A13			A
B10-1A14/1C14	11	B08-1A14/1C14	11	4	B05A14			A
B10-1A14/1C14	22	B13-1A14/1C14	22	4	B05A14			A
B10-1A15/1C15	11	B08-1A15/1C15	11	4	B05A15			A
B10-1A15/1C15	22	B13-1A15/1C15	22	4	B05A15			A
B10-1A16/1C16	11	B08-1A16/1C16	11	4	B05A16			A
B10-1A16/1C16	22	B13-1A16/1C16	22	4	B05A16			A
B10-1B08/1D08	11	B08-1B08/1D08	11	4	B05B08			A
B10-1B08/1D08	22	B13-1B08/1D08	22	4	B05B08			A
B10-1B09/1D09	11	B08-1B09/1D09	11	4	B05B09			A
B10-1B09/1D09	22	B13-1B09/1D09	22	4	B05B09			A
B10-1B10/1D10	11	B08-1B10/1D10	11	4	B05B10			A
B10-1B10/1D10	22	B13-1B10/1D10	22	4	B05B10			A
B10-1B11/1D11	11	B08-1B11/1D11	11	4	B05B11			A
B10-1B11/1D11	22	B13-1B11/1D11	22	4	B05B11			A
B10-1B12/1D12	11	B08-1B12/1D12	11	4	B05B12			A
B10-1B12/1D12	22	B13-1B12/1D12	22	4	B05B12			A
B10-1B13/1D13	11	B08-1B13/1D13	11	4	B05B13			A
B10-1B13/1D13	22	B13-1B13/1D13	22	4	B05B13			A
B10-1B14/1D14	11	B08-1B14/1D14	11	4	B05B14			A
B10-1B14/1D14	22	B13-1B14/1D14	22	4	B05B14			A
B10-1B15/1D15	11	B08-1B15/1D15	11	4	B05B15			A
B10-1B15/1D15	22	B13-1B15/1D15	22	4	B05B15			A

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PAGE   100  PACK        B10

     ORIGIN          LEVS       DESTINATION       LEVS   LTH     SIGNAL   CBL   COLORS   REV


     B10-1B16/1D16    11          B08-1B16/1D16    11      4     B05B16                    A
     B10-1B16/1D16    22          B13-1B16/1D16    22      4     B05B16                    A

     B10-2A34/2C34    11          B13-1A35/1C35    11      8     B05A84                    A
     B10-2A34/2C34    22          B08-2A34/2C34    22      4     B05A84                    A

     B10-2A35/2C35    11          B08-2A35/2C35    11      4     B05A85                    A
     B10-2A35/2C35    22          B14-2A35/2C35    22      5     B05A85                    A

     B10-2A36/2C36    11          B08-2A36/2C36    11      4     B05A86                    A
     B10-2A36/2C36    22          B14-2A36/2C36    22      5     B05A86                    A

     B10-2A37/2C37    11          B08-2A37/2C37    11      4     B05A87                    A
     B10-2A37/2C37    22          B14-2A37/2C37    22      5     B05A87                    A

     B10-2A38/2C38    11          B08-2A38/2C38    11      4     B05A88                    A
     B10-2A38/2C38    22          B14-2A38/2C38    22      5     B05A88                    A

     B10-2A40/2C40    11          B08-2A40/2C40    11      4     B05A90                    A
     B10-2A40/2C40    22          B14-2A40/2C40    22      5     B05A90                    A

     B10-2A41/2C41    11          B08-2A41/2C41    11      4     B05A91                    A
     B10-2A41/2C41    22          B14-2A41/2C41    22      5     B05A91                    A

     B10-2A42/2C42    11          B08-2A42/2C42    11      4     B05A92                    A
     B10-2A42/2C42    22          B14-2A42/2C42    22      5     B05A92                    A

     B10-2A43/2C43    11          B08-2A43/2C43    11      4     B05A93                    A
     B10-2A43/2C43    22          B14-2A43/2C43    22      5     B05A93                    A

     B10-2B33/2D33    11          B13-1B34/1D34    11      8     B05B83                    A
     B10-2B33/2D33    22          B08-2B33/2D33    22      4     B05B83                    A

     B10-2B34/2D34    11          B17-2B34/2D34    11      7     B05B84                    A
     B10-2B34/2D34    22          B08-2B34/2D34    22      4     B05B84                    A

     B10-2B35/2D35    11          B08-2B35/2D35    11      4     B05B85                    A
     B10-2B35/2D35    22          B14-2B35/2D35    22      5     B05B85                    A

     B10-2B36/2D36    11          B08-2B36/2D36    11      4     B05B86                    A
     B10-2B36/2D36    22          B14-2B36/2D36    22      5     B05B86                    A

     B10-2B37/2D37    11          B08-2B37/2D37    11      4     B05B87                    A
     B10-2B37/2D37    22          B14-2B37/2D37    22      5     B05B87                    A

     B10-2B38/2D38    11          B08-2B38/2D38    11      4     B05B88                    A
     B10-2B38/2D38    22          B14-2B38/2D38    22      5     B05B88                    A

     B10-2B40/2D40    11          B08-2B40/2D40    11      4     B05B90                    A
     B10-2B40/2D40    22          B14-2B40/2D40    22      5     B05B90                    A

     B10-2B41/2D41    11          B08-2B41/2D41    11      4     B05B91                    A
     B10-2B41/2D41    22          B14-2B41/2D41    22      5     B05B91                    A
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PAGE   101  PACK        B10

     ORIGIN        LEVS      DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV


     B10-2B42/2D42  11         B08-2B42/2D42  11     4   B05B92                 A
     B10-2B42/2D42  22         B14-2B42/2D42  22     5   B05B92                 A

     B10-2B43/2D43  11         B08-2B43/2D43  11     4   B05B93                 A
     B10-2B43/2D43  22         B14-2B43/2D43  22     5   B05B93                 A
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PAGE   102   PACK        B13
     ORIGIN          LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL  COLORS  REV

     B13-1A03/1C03   11         B14-2A31/2C31    11     11   B14A81                  A

     B13-1A04/1C04   11         B09-1A04/1C04    11      5   B05A04                  A
     B13-1A04/1C04   22         B14-1A04/1C04    22      3   B05A04                  A

     B13-1A05/1C05   11         B14-2B32/2D32    11     11   B14B82                  A

     B13-1A07/1C07   11         B10-1A07/1C07    11      4   B05A07                  A
     B13-1A07/1C07   22         B16-1A07/1C07    22      4   B05A07                  A

     B13-1A08/1C08   11         B17-1A08/1C08    11      5   B05A08                  A
     B13-1A08/1C08   22         B10-1A08/1C08    22      4   B05A08                  A

     B13-1A09/1C09   11         B17-1A09/1C09    11      5   B05A09                  A
     B13-1A09/1C09   22         B10-1A09/1C09    22      4   B05A09                  A

     B13-1A10/1C10   11         B17-1A10/1C10    11      5   B05A10                  A
     B13-1A10/1C10   22         B10-1A10/1C10    22      4   B05A10                  A

     B13-1A11/1C11   11         B17-1A11/1C11    11      5   B05A11                  A
     B13-1A11/1C11   22         B10-1A11/1C11    22      4   B05A11                  A

     B13-1A12/1C12   11         B18-1A08/1C08    11      6   B05A12                  A
     B13-1A12/1C12   22         B10-1A12/1C12    22      4   B05A12                  A

     B13-1A13/1C13   11         B18-1A09/1C09    11      6   B05A13                  A
     B13-1A13/1C13   22         B10-1A13/1C13    22      4   B05A13                  A

     B13-1A14/1C14   11         B18-1A10/1C10    11      6   B05A14                  A
     B13-1A14/1C14   22         B10-1A14/1C14    22      4   B05A14                  A

     B13-1A15/1C15   11         B18-1A11/1C11    11      6   B05A15                  A
     B13-1A15/1C15   22         B10-1A15/1C15    22      4   B05A15                  A

     B13-1A16/1C16   11         B17-1A16/1C16    11      5   B05A16                  A
     B13-1A16/1C16   22         B10-1A16/1C16    22      4   B05A16                  A

     B13-1A17/1C17   11         B14-2A28/2C28    11      9   B14A78                  A

     B13-1A18/1C18   11         B14-2A27/2C27    11      9   B14A77                  A

     B13-1A19/1C19   11         B14-2A30/2C30    11      9   B14A80                  A

     B13-1A20/1C20   11         B14-2B30/2D30    11      9   B14B80                  A

     B13-1A22/1C22   11         B19-1A09/1C09    11      6   B13A22                  A

     B13-1A24/1C24   11         B19-1A28/1C28    11      6   B13A24                  A

     B13-1A25/1C25   11         B19-1A29/1C29    11      6   B13A25                  A

     B13-1A26/1C26   11         B19-1A31/1C31    11      6   B13A26                  A
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PAGE   103  PACK        B13

     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     B13-1A27/1C27   11           B19-1A32/1C32  11      6    B13A27                    A

     B13-1A28/1C28   11           B19-1A33/1C33  11      6    B13A28                    A

     B13-1A29/1C29   11           B14-2B25/2D25  11      8    B14B75                    A

     B13-1A30/1C30   11           B14-2B26/2D26  11      8    B14B76                    A

     B13-1A31/1C31   11           B14-2B27/2D27  11      8    B14B77                    A

     B13-1A34/1C34   11           B05-1B40/1D40  11      7    B13A34                    A

     B13-1A35/1C35   11           B10-2A34/2C34  11      8    B05A84                    A
     B13-1A35/1C35   22           B14-2A34/2C34  22      6    B05A84                    A

     B13-1A37/1C37   11           B15-2A26/2C26  11      7    B15A76                    A

     B13-1A38/1C38   11           B05-2A22/2C22  11      9    B13A38                    A

     B13-1A40/1C40   11           B16-2B25/2D25  11      7    B13A40                    A

     B13-1B03/1D03   11           B14-1B03/1D03  11      3    B05B03                    A
     B13-1B03/1D03   22           B09-1B03/1D03  22      5    B05B03                    A

     B13-1B04/1D04   11           B14-2B31/2D31  11     11    B14B81                    A

     B13-1B05/1D05   11           B09-1B05/1D05  11      5    B05B05                    A
     B13-1B05/1D05   22           B14-1B05/1D05  22      3    B05B05                    A

     B13-1B07/1D07   11           B14-2B33/2D33  11     11    B14B83                    A

     B13-1B08/1D08   11           B17-1B08/1D08  11      5    B05B08                    A
     B13-1B08/1D08   22           B10-1B08/1D08  22      4    B05B08                    A

     B13-1B09/1D09   11           B17-1B09/1D09  11      5    B05B09                    A
     B13-1B09/1D09   22           B10-1B09/1D09  22      4    B05B09                    A

     B13-1B10/1D10   11           B17-1B10/1D10  11      5    B05B10                    A
     B13-1B10/1D10   22           B10-1B10/1D10  22      4    B05B10                    A

     B13-1B11/1D11   11           B17-1B11/1D11  11      5    B05B11                    A
     B13-1B11/1D11   22           B10-1B11/1D11  22      4    B05B11                    A

     B13-1B12/1D12   11           B18-1B08/1D08  11      6    B05B12                    A
     B13-1B12/1D12   22           B10-1B12/1D12  22      4    B05B12                    A

     B13-1B13/1D13   11           B18-1B09/1D09  11      6    B05B13                    A
     B13-1B13/1D13   22           B10-1B13/1D13  22      4    B05B13                    A

     B13-1B14/1D14   11           B18-1B10/1D10  11      6    B05B14                    A
     B13-1B14/1D14   22           B10-1B14/1D14  22      4    B05B14                    A

     B13-1B15/1D15   11           B18-1B11/1D11  11      6    B05B15                    A
     B13-1B15/1D15   22           B10-1B15/1D15  22      4    B05B15                    A
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PAGE   104  PACK        B13
     ORIGIN        LEVS      DESTINATION     LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B13-1B16/1D16  11        B18-1A16/1C16  11     5   B05B16                 A
     B13-1B16/1D16  22        B10-1B16/1D16  22     4   B05B16                 A

     B13-1B17/1D17  11        B14-2B28/2D28  11     9   B14B78                 A

     B13-1B18/1D18  11        B14-2B29/2D29  11     9   B14B79                 A

     B13-1B19/1D19  11        B14-2A29/2C29  11     9   B14A79                 A

     B13-1B20/1D20  11        B14-1A43/1C43  11     5   B14A43                 A

     B13-1B21/1D21  11        B16-1B24/1D24  11     4   B18A88                 A

     B13-1B22/1D22  11        B15-2A34/2C34  11     9   B18A13                 A

     B13-1B24/1D24  11        B16-1B21/1D21  11     4   B13B24                 A

     B13-1B25/1D25  11        B16-1B22/1D22  11     4   B13B25                 A

     B13-1B26/1D26  11        B19-1A16/1C16  11     6   B13B26                 A

     B13-1B27/1D27  11        B19-1A17/1C17  11     6   B13B27                 A

     B13-1B28/1D28  11        B19-1A18/1C18  11     6   B13B28                 A

     B13-1B29/1D29  11        B14-2A26/2C26  11     8   B14A76                 A

     B13-1B30/1D30  11        B19-1A34/1C34  11     6   B13B30                 A

     B13-1B31/1D31  11        B04-2B25/2D25  11    10   B04B75                 A

     B13-1B33/1D33  11        B16-2B34/2D34  11     8   B13B33                 A

     B13-1B34/1D34  11        B10-2B33/2D33  11     8   B05B83                 A
     B13-1B34/1D34  22        B17-2B33/2D33  22     8   B05B83                 A

     B13-1B37/1D37  22        B21-2A18/2C18  22     8   B13B37                 A

     B13-1B38/1D38  11        B17-1B12/1D12  11     6   B13B38                 A

     B13-2A15/2C15  11        B14-1A32/1C32  11     6   B14A32                 A

     B13-2B15/2D15  11        B14-2B15/2D15  11     3   B14B65                 A
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PAGE   105  PACK         B14

     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B14-1AC3/1C03  11          B17-1AC3/1C03  11     4   B05A03                  A
     B14-1AC3/1C03  22          B09-1AC3/1C03  22     5   B05A03                  A

     B14-1AC4/1C04  11          B16-1AC4/1C04  11     4   B05A04                  A
     B14-1AC4/1C04  22          B13-1AC4/1C04  22     3   B05A04                  A

     B14-1AC5/1C05  11          B16-1A27/1C27  11     5   B14AC5                  A

     B14-1A17/1C17  11          B19-1B21/1D21  11     6   B14A17                  A

     B14-1A21/1C21  11          B15-1B33/1D33  11     4   B15B33                  A

     B14-1A22/1C22  11          B16-2A22/2C22  11     6   B17A64                  A

     B14-1A24/1C24  11          B15-1A24/1C24  11     3   B15A24                  A

     B14-1A25/1C25  11          B15-1A25/1C25  11     3   B15A25                  A

     B14-1A26/1C26  11          B15-1A26/1C26  11     3   B15A26                  A

     B14-1A27/1C27  11          B15-1A27/1C27  11     3   B15A27                  A

     B14-1A28/1C28  11          B15-1A28/1C28  11     3   B15A28                  A

     B14-1A29/1C29  11          B15-1A29/1C29  11     3   B15A29                  A

     B14-1A30/1C30  11          B15-1A30/1C30  11     3   B15A30                  A

     B14-1A31/1C31  11          B15-1A31/1C31  11     3   B15A31                  A

     B14-1A32/1C32  11          B13-2A15/2C15  11     6   B14A32                  A

     B14-1A33/1C33  11          B15-1B37/1D37  11     3   B15B37                  A
     B14-1A33/1C33  22          B17-2B16/2D16  22     7   B15B37                  A

     B14-1A34/1C34  11          B19-1B30/1D30  11     6   B14A34                  A

     B14-1A35/1C35  11          B17-2B32/2D32  11     8   B14A35                  A

     B14-1A36/1C36  11          B15-1A41/1C41  11     3   B15A41                  A
     B14-1A36/1C36  22          B17-2B17/2D17  22     7   B15A41                  A

     B14-1A37/1C37  11          B15-1A42/1C42  11     3   B15A42                  A
     B14-1A37/1C37  22          B17-2B18/2D18  22     7   B15A42                  A

     B14-1A38/1C38  11          B17-2A18/2C18  11     7   B14A38                  A

     B14-1A40/1C40  11          B16-2B24/2D24  11     7   B02B79                  A
     B14-1A40/1C40  22          B05-2BC4/2D04  22     8   B02B79                  A

     B14-1A42/1C42  11          B15-1B42/1D42  11     3   B15B42                  A

     B14-1A43/1C43  11          B13-1B20/1D20  11     5   B14A43                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B14-1B03/1D03	11	B13-1B03/1D03	11	3	B05B03			A
B14-1B03/1D03	22	B16-1B03/1D03	22	4	B05B03			A
B14-1B04/1D04	11	B16-1B35/1D35	11	6	B16B35			A
B14-1B05/1D05	11	B16-1B05/1D05	11	4	B05B05			A
B14-1B05/1D05	22	B13-1B05/1D05	22	3	B05B05			A
B14-1B07/1D07	11	B15-2B25/2D25	11	10	B15B75			A
B14-1B08/1D08	11	B16-2A07/2C07	11	8	B14B08			A
B14-1B17/1D17	11	B17-1A42/1C42	11	5	B14B17			A
B14-1B21/1D21	11	B16-1A42/1C42	11	5	B16A42			A
B14-1B24/1D24	11	B15-1B24/1D24	11	3	B15B24			A
B14-1B25/1D25	11	B15-1B25/1D25	11	3	B15B25			A
B14-1B26/1D26	11	B15-1B26/1D26	11	3	B15B26			A
B14-1B27/1D27	11	B15-1B27/1D27	11	3	B15B27			A
B14-1B28/1D28	11	B15-1B28/1D28	11	3	B15B28			A
B14-1B29/1D29	11	B15-1B29/1D29	11	3	B15B29			A
B14-1B30/1D30	11	B15-1B30/1D30	11	3	B15B30			A
B14-1B31/1D31	11	B15-1B31/1D31	11	3	B15B31			A
B14-1B33/1D33	11	B17-1A13/1C13	11	5	B17A13			A
B14-1B34/1D34	11	B19-1B33/1D33	11	6	B14B34			A
B14-1B35/1D35	11	B05-2B08/2D08	11	9	B14B35			A
B14-1B36/1D36	11	B15-1B41/1D41	11	3	B15B41			A
B14-1B36/1D36	22	B17-2A17/2C17	22	7	B15B41			A
B14-1B37/1D37	11	B02-2B19/2D19	11	11	B14B37			A
B14-1B38/1D38	22	B08-2B20/2D20	22	8	B14B38			A
B14-1B40/1D40	11	B16-2A41/2C41	11	8	B14B40			A
B14-1B41/1D41	11	B15-1A38/1C38	11	3	B15A38			A
B14-1B42/1D42	11	B15-2B05/2D05	11	4	B15B55			A
B14-1B43/1D43	11	B15-1A34/1C34	11	3	B15A34			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B14-2A03/2C03	11	B19-2A41/2C41	11	7	B14A53			A
B14-2A04/2C04	11	B19-2B33/2D33	11	7	B14A54			A
B14-2A05/2C05	11	B16-2A25/2C25	11	5	B14A55			A
B14-2A07/2C07	11	B15-2A07/2C07	11	3	B15A57			A
B14-2A08/2C08	11	B15-2A08/2C08	11	3	B15A58			A
B14-2A09/2C09	11	B15-2A09/2C09	11	3	B15A59			A
B14-2A10/2C10	11	B15-2A10/2C10	11	3	B15A60			A
B14-2A11/2C11	11	B15-2A11/2C11	11	3	B15A61			A
B14-2A12/2C12	11	B15-2A12/2C12	11	3	B15A62			A
B14-2A13/2C13	11	B15-2A13/2C13	11	3	B15A63			A
B14-2A14/2C14	11	B15-2A14/2C14	11	3	B15A64			A
B14-2A16/2C16	11	B16-1A22/1C22	11	6	B16A22			A
B14-2A17/2C17	11	B02-1B36/1D36	11	10	B02B36			A
B14-2A26/2C26	11	B13-1B29/1D29	11	8	B14A76			A
B14-2A27/2C27	11	B13-1A18/1C18	11	9	B14A77			A
B14-2A28/2C28	11	B13-1A17/1C17	11	9	B14A78			A
B14-2A29/2C29	11	B13-1B19/1D19	11	9	B14A79			A
B14-2A30/2C30	11	B13-1A19/1C19	11	9	B14A80			A
B14-2A31/2C31	11	B13-1A03/1C03	11	11	B14A81			A
B14-2A32/2C32	11	B02-1A20/1C20	11	12	B14A82			A
B14-2A33/2C33	11	B16-2B41/2D41	11	4	B14A83			A
B14-2A34/2C34	11	B17-2A34/2C34	11	4	B05A84			A
B14-2A34/2C34	22	B13-1A35/1C35	22	8	B05A84			A
B14-2A35/2C35	11	B15-2A35/2C35	11	3	B05A85			A
B14-2A35/2C35	22	B10-2A35/2C35	22	5	B05A85			A
B14-2A36/2C36	11	B15-2A36/2C36	11	3	B05A86			A
B14-2A36/2C36	22	B10-2A36/2C36	22	5	B05A86			A
B14-2A37/2C37	11	B15-2A37/2C37	11	3	B05A87			A
B14-2A37/2C37	22	B10-2A37/2C37	22	5	B05A87			A

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PAGE   108  PACK        B14

     ORIGIN          LEVS        DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS   REV

     B14-2A38/2C38   11          B15-2A38/2C38   11      3    B05A88                   A
     B14-2A38/2C38   22          B10-2A38/2C38   22      5    B05A88                   A

     B14-2A40/2C40   11          B15-2A40/2C40   11      3    B05A90                   A
     B14-2A40/2C40   22          B10-2A40/2C40   22      5    B05A90                   A

     B14-2A41/2C41   11          B15-2A41/2C41   11      3    B05A91                   A
     B14-2A41/2C41   22          B10-2A41/2C41   22      5    B05A91                   A

     B14-2A42/2C42   11          B15-2A42/2C42   11      3    B05A92                   A
     B14-2A42/2C42   22          B10-2A42/2C42   22      5    B05A92                   A

     B14-2A43/2C43   11          B15-2A43/2C43   11      3    B05A93                   A
     B14-2A43/2C43   22          B10-2A43/2C43   22      5    B05A93                   A

     B14-2B03/2D03   11          B19-2B43/2D43   11      7    B14B53                   A

     B14-2B04/2D04   22          B05-2B15/2D15   22      8    B14B54                   A

     B14-2B07/2D07   11          B15-2B07/2D07   11      3    B15B57                   A

     B14-2B08/2D08   11          B15-2B08/2D08   11      3    B15B58                   A

     B14-2B09/2D09   11          B15-2B09/2D09   11      3    B15B59                   A

     B14-2B10/2D10   11          B15-2B10/2D10   11      3    B15B60                   A

     B14-2B11/2D11   11          B15-2B11/2D11   11      3    B15B61                   A

     B14-2B12/2D12   11          B15-2B12/2D12   11      3    B15B62                   A

     B14-2B13/2D13   11          B15-2B13/2D13   11      3    B15B63                   A

     B14-2B14/2D14   11          B15-2B14/2D14   11      3    B15B64                   A

     B14-2B15/2D15   11          B13-2B15/2D15   11      3    B14B65                   A

     B14-2B16/2D16   11          B05-2A09/2C09   11      8    B04B84                   A

     B14-2B25/2D25   11          B13-1A29/1C29   11      8    B14B75                   A

     B14-2B26/2D26   11          B13-1A30/1C30   11      8    B14B76                   A

     B14-2B27/2D27   11          B13-1A31/1C31   11      8    B14B77                   A

     B14-2B28/2D28   11          B13-1B17/1D17   11      9    B14B78                   A

     B14-2B29/2D29   11          B13-1B18/1D18   11      9    B14B79                   A

     B14-2B30/2D30   11          B13-1A20/1C20   11      9    B14B80                   A

     B14-2B31/2D31   11          B13-1B04/1D04   11     11    B14B81                   A

     B14-2B32/2D32   11          B13-1A05/1C05   11     11    B14B82                   A
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PAGE   109  RACK        B14
     ORIGIN        LEVS      DESTINATION     LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B14-2B33/2D33  11        B13-1B07/1D07  11    11   B14B83                  A

     B14-2B34/2D34  11        B17-1A12/1C12  11    10   B14B84                  A

     B14-2B35/2D35  11        B15-2B35/2D35  11     3   B05B85                  A
     B14-2B35/2D35  22        B10-2B35/2D35  22     5   B05B85                  A

     B14-2B36/2D36  11        B15-2B36/2D36  11     3   B05B86                  A
     B14-2B36/2D36  22        B10-2B36/2D36  22     5   B05B86                  A

     B14-2B37/2D37  11        B15-2B37/2D37  11     3   B05B87                  A
     B14-2B37/2D37  22        B10-2B37/2D37  22     5   B05B87                  A

     B14-2B38/2D38  11        B15-2B38/2D38  11     3   B05B88                  A
     B14-2B38/2D38  22        B10-2B38/2D38  22     5   B05B88                  A

     B14-2B40/2D40  11        B15-2B40/2D40  11     3   B05B90                  A
     B14-2B40/2D40  22        B10-2B40/2D40  22     5   B05B90                  A

     B14-2B41/2D41  11        B15-2B41/2D41  11     3   B05B91                  A
     B14-2B41/2D41  22        B10-2B41/2D41  22     5   B05B91                  A

     B14-2B42/2D42  11        B15-2B42/2D42  11     3   B05B92                  A
     B14-2B42/2D42  22        B10-2B42/2D42  22     5   B05B92                  A

     B14-2B43/2D43  11        B15-2B43/2D43  11     3   B05B93                  A
     B14-2B43/2D43  22        B10-2B43/2D43  22     5   B05B93                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B15-1A12/1C12	11	B17-1B18/1C18	11	4	B17B18			A
B15-1A13/1C13	11	B15-1B34/1D34	11	5	B15B34			A
B15-1A24/1C24	11	B14-1A24/1C24	11	3	B15A24			A
B15-1A24/1C24	22	B17-1A24/1C24	22	4	B15A24			A
B15-1A25/1C25	11	B14-1A25/1C25	11	3	B15A25			A
B15-1A25/1C25	22	B17-1A25/1C25	22	4	B15A25			A
B15-1A26/1C26	11	B14-1A26/1C26	11	3	B15A26			A
B15-1A26/1C26	22	B17-1A26/1C26	22	4	B15A26			A
B15-1A27/1C27	11	B14-1A27/1C27	11	3	B15A27			A
B15-1A27/1C27	22	B17-1A27/1C27	22	4	B15A27			A
B15-1A28/1C28	11	B14-1A28/1C28	11	3	B15A28			A
B15-1A28/1C28	22	B18-1A24/1C24	22	4	B15A28			A
B15-1A29/1C29	11	B14-1A29/1C29	11	3	B15A29			A
B15-1A29/1C29	22	B18-1A25/1C25	22	4	B15A29			A
B15-1A30/1C30	11	B14-1A30/1C30	11	3	B15A30			A
B15-1A30/1C30	22	B18-1A26/1C26	22	4	B15A30			A
B15-1A31/1C31	11	B14-1A31/1C31	11	3	B15A31			A
B15-1A31/1C31	22	B18-1A27/1C27	22	4	B15A31			A
B15-1A32/1C32	11	B17-1A07/1C07	11	5	B17A07			A
B15-1A34/1C34	11	B14-1B43/1D43	11	3	B15A34			A
B15-1A35/1C35	11	B19-1A22/1C22	11	5	B15A35			A
B15-1A38/1C38	11	B14-1B41/1D41	11	3	B15A38			A
B15-1A40/1C40	11	B17-1B41/1D41	11	4	B15A40			A
B15-1A41/1C41	11	B14-1A36/1C36	11	3	B15A41			A
B15-1A42/1C42	11	B14-1A37/1C37	11	3	B15A42			A
B15-1A43/1C43	11	B16-2B40/2D40	11	6	B15A43			A
B15-1B03/1D03	11	B15-2B27/2D27	11	10	B15B77			A
B15-1B24/1D24	11	B14-1B24/1D24	11	3	B15B24			A
B15-1B24/1D24	22	B17-1B24/1D24	22	4	B15B24			A
B15-1B25/1D25	11	B14-1B25/1D25	11	3	B15B25			A
B15-1B25/1D25	22	B17-1B25/1D25	22	4	B15B25			A
B15-1B26/1D26	11	B14-1B26/1D26	11	3	B15B26			A

ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B15-1B26/1C26	22	B17-1B26/1D26	22	4	B15B26			A
B15-1B27/1C27	11	B14-1B27/1D27	11	3	B15B27			A
B15-1B27/1C27	22	B17-1B27/1D27	22	4	B15B27			A
B15-1B28/1C28	11	B14-1B28/1D28	11	3	B15B28			A
B15-1B28/1C28	22	B18-1B24/1D24	22	4	B15B28			A
B15-1B29/1C29	11	B14-1B29/1D29	11	3	B15B29			A
B15-1B29/1C29	22	B18-1B25/1D25	22	4	B15B29			A
B15-1B30/1C30	11	B14-1B30/1D30	11	3	B15B30			A
B15-1B30/1C30	22	B18-1B26/1D26	22	4	B15B30			A
B15-1B31/1C31	11	B14-1B31/1D31	11	3	B15B31			A
B15-1B31/1C31	22	B18-1B27/1D27	22	4	B15B31			A
B15-1B33/1C33	11	B14-1A21/1C21	11	4	B15B33			A
B15-1B34/1C34	11	B15-1A13/1C13	11	5	B15B34			A
B15-1B35/1C35	11	B17-1A35/1C35	11	3	B15B35			A
B15-1B37/1C37	11	B14-1A33/1C33	11	3	B15B37			A
B15-1B38/1C38	11	B18-1B41/1D41	11	4	B15B38			A
B15-1B41/1C41	11	B14-1B36/1D36	11	3	B15B41			A
B15-1B42/1C42	11	B14-1A42/1C42	11	3	B15B42			A
B15-1B42/1C42	22	B16-2A40/2C40	22	8	B15B42			A
B15-2A03/2C03	11	B17-1A21/1C21	11	6	B17A21			A
B15-2A05/2C05	11	B16-2B08/2D08	11	3	B15A55			A
B15-2A07/2C07	11	B14-2A07/2C07	11	3	B15A57			A
B15-2A07/2C07	22	B17-2A07/2C07	22	4	B15A57			A
B15-2A08/2C08	11	B14-2A08/2C08	11	3	B15A58			A
B15-2A08/2C08	22	B17-2A08/2C08	22	4	B15A58			A
B15-2A09/2C09	11	B14-2A09/2C09	11	3	B15A59			A
B15-2A09/2C09	22	B17-2A09/2C09	22	4	B15A59			A
B15-2A10/2C10	11	B14-2A10/2C10	11	3	B15A60			A
B15-2A10/2C10	22	B17-2A10/2C10	22	4	B15A60			A
B15-2A11/2C11	11	B14-2A11/2C11	11	3	B15A61			A
B15-2A11/2C11	22	B18-2A07/2C07	22	4	B15A61			A
B15-2A12/2C12	11	B14-2A12/2C12	11	3	B15A62			A
B15-2A12/2C12	22	B18-2A08/2C08	22	4	B15A62			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B15-2A13/2C13	11	B14-2A13/2C13	11	3	B15A63			A
B15-2A13/2C13	22	B18-2A09/2C09	22	4	B15A63			A
B15-2A14/2C14	11	B14-2A14/2C14	11	3	B15A64			A
B15-2A14/2C14	22	B18-2A10/2C10	22	4	B15A64			A
B15-2A17/2C17	11	B17-2A13/2C13	11	4	B17A63			A
B15-2A20/2C20	11	B17-2B03/2D03	11	5	B15A70			A
B15-2A21/2C21	11	B17-2B13/2D13	11	4	B15A71			A
B15-2A22/2C22	11	B17-2B15/2D15	11	4	B15A72			A
B15-2A24/2C24	11	B19-2A43/2C43	11	6	B15A74			A
B15-2A25/2C25	11	B19-2B20/2D20	11	5	B15A75			A
B15-2A26/2C26	11	B13-1A37/1C37	11	7	B15A76			A
B15-2A27/2C27	11	B17-2B36/2D36	11	4	B15A77			A
B15-2A33/2C33	11	B19-1A21/1C21	11	10	B15A83			A
B15-2A34/2C34	11	B13-1B22/1D22	11	9	B18A13			A
B15-2A34/2C34	22	B16-2A03/2C03	22	6	B18A13			A
B15-2A35/2C35	11	B14-2A35/2C35	11	3	B05A85			A
B15-2A35/2C35	22	B21-2A35/2C35	22	6	B05A85			A
B15-2A36/2C36	11	B14-2A36/2C36	11	3	B05A86			A
B15-2A36/2C36	22	B21-2A36/2C36	22	6	B05A86			A
B15-2A37/2C37	11	B14-2A37/2C37	11	3	B05A87			A
B15-2A37/2C37	22	B21-2A37/2C37	22	6	B05A87			A
B15-2A38/2C38	11	B14-2A38/2C38	11	3	B05A88			A
B15-2A38/2C38	22	B21-2A38/2C38	22	6	B05A88			A
B15-2A40/2C40	11	B14-2A40/2C40	11	3	B05A90			A
B15-2A40/2C40	22	B21-2A40/2C40	22	6	B05A90			A
B15-2A41/2C41	11	B14-2A41/2C41	11	3	B05A91			A
B15-2A41/2C41	22	B21-2A41/2C41	22	6	B05A91			A
B15-2A42/2C42	11	B14-2A42/2C42	11	3	B05A92			A
B15-2A42/2C42	22	B21-2A42/2C42	22	6	B05A92			A
B15-2A43/2C43	11	B14-2A43/2C43	11	3	B05A93			A
B15-2A43/2C43	22	B21-2A43/2C43	22	6	B05A93			A
B15-2B05/2D05	11	B14-1B42/1D42	11	4	B15B55			A
B15-2B05/2D05	22	B17-1A41/1C41	22	5	B15B55			A

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     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL  CBL  COLORS  REV

     B15-2B07/2D07   11         B14-2B07/2D07    11      3    B15B57                 A
     B15-2B07/2D07   22         B17-2B07/2D07    22      4    B15B57                 A

     B15-2B08/2D08   11         B14-2B08/2D08    11      3    B15B58                 A
     B15-2B08/2D08   22         B17-2B08/2D08    22      4    B15B58                 A

     B15-2B09/2D09   11         B14-2B09/2D09    11      3    B15B59                 A
     B15-2B09/2D09   22         B17-2B09/2D09    22      4    B15B59                 A

     B15-2B10/2D10   11         B14-2B10/2D10    11      3    B15B60                 A
     B15-2B10/2D10   22         B17-2B10/2D10    22      4    B15B60                 A

     B15-2B11/2D11   11         B14-2B11/2D11    11      3    B15B61                 A
     B15-2B11/2D11   22         B18-2B07/2D07    22      4    B15B61                 A

     B15-2B12/2D12   11         B14-2B12/2D12    11      3    B15B62                 A
     B15-2B12/2D12   22         B18-2B08/2D08    22      4    B15B62                 A

     B15-2B13/2D13   11         B14-2B13/2D13    11      3    B15B63                 A
     B15-2B13/2D13   22         B18-2B09/2D09    22      4    B15B63                 A

     B15-2B14/2D14   11         B14-2B14/2D14    11      3    B15B64                 A
     B15-2B14/2D14   22         B18-2B10/2D10    22      4    B15B64                 A

     B15-2B19/2D19   11         B02-2A21/2C21    11     11    B15B69                 A
     B15-2B19/2D19   22         B05-1A22/1C22    22     11    B15B69                 A

     B15-2B20/2D20   11         B17-1B42/1D42    11      6    B15B70                 A

     B15-2B21/2D21   11         B19-2B11/2D11    11      5    B15B71                 A

     B15-2B22/2D22   11         B16-1A41/1C41    11      6    B15B72                 A

     B15-2B24/2D24   11         B19-2B17/2D17    11      5    B15B74                 A

     B15-2B25/2D25   11         B14-1B07/1D07    11     10    B15B75                 A

     B15-2B26/2D26   11         B19-2B35/2D35    11      5    B15B76                 A

     B15-2B27/2D27   11         B15-1B03/1D03    11     10    B15B77                 A

     B15-2B31/2D31   11         B09-2B31/2D31    11      6    B05B81                 A
     B15-2B31/2D31   22         B17-2B31/2D31    22      4    B05B81                 A

     B15-2B33/2D33   11         B19-1B22/1D22    11     10    B15B83                 A

     B15-2B34/2D34   11         B19-2B36/2D36    11      5    B15B84                 A

     B15-2B35/2D35   11         B14-2B35/2D35    11      3    B05B85                 A
     B15-2B35/2D35   22         B21-2B35/2D35    22      6    B05B85                 A

     B15-2B36/2D36   11         B14-2B36/2D36    11      3    B05B86                 A
     B15-2B36/2D36   22         B21-2B36/2D36    22      6    B05B86                 A
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     ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS  REV

     B15-2B37/2C37   11          B14-2B37/2D37   11     3    B05B87                  A
     B15-2B37/2C37   22          B21-2B37/2D37   22     6    B05B87                  A

     B15-2B38/2C38   11          B14-2B38/2D38   11     3    B05B88                  A
     B15-2B38/2C38   22          B21-2B38/2D38   22     6    B05B88                  A

     B15-2B40/2C40   11          B14-2B40/2D40   11     3    B05B90                  A
     B15-2B40/2C40   22          B21-2B40/2D40   22     6    B05B90                  A

     B15-2B41/2C41   11          B14-2B41/2C41   11     3    B05B91                  A
     B15-2B41/2C41   22          B21-2B41/2C41   22     6    B05B91                  A

     B15-2B42/2C42   11          B14-2B42/2D42   11     3    B05B92                  A
     B15-2B42/2C42   22          B21-2B42/2D42   22     6    B05B92                  A

     B15-2B43/2C43   11          B14-2B43/2D43   11     3    B05B93                  A
     B15-2B43/2C43   22          B21-2B43/2D43   22     6    B05B93                  A
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PAGE   115  PACK         B16
     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL   CBL   COLORS  REV

     B16-1A04/1C04  11         B14-1A04/1C04   11     4   B05A04                   A
     B16-1A04/1C04  22         B17-1A04/1C04   22     3   B05A04                   A

     B16-1A07/1C07  22         B13-1A07/1C07   22     4   B05A07                   A

     B16-1A21/1C21  11         B17-1A31/1C31   11     4   B17A31                   A

     B16-1A22/1C22  11         B14-2A16/2C16   11     8   B16A22                   A

     B16-1A27/1C27  11         B14-1A05/1C05   11     5   B14A05                   A

     B16-1A32/1C32  11         B19-1A30/1C30   11     4   B16A32                   A

     B16-1A33/1C33  11         B17-1A43/1C43   11     4   B17A43                   A

     B16-1A36/1C36  11         B17-1B43/1D43   11     4   B17B43                   A

     B16-1A40/1C40  11         B17-2A40/2C40   11     8   B17A90                   A

     B16-1A41/1C41  11         B15-2B22/2D22   11     6   B15B72                   A

     B16-1A42/1C42  11         B14-1B21/1D21   11     5   B16A42                   A
     B16-1A42/1C42  22         B17-1A22/1C22   22     5   B16A42                   A

     B16-1B03/1D03  11         B17-1B03/1D03   11     3   B05B03                   A
     B16-1B03/1D03  22         B14-1B03/1D03   22     4   B05B03                   A

     B16-1B05/1D05  11         B14-1B05/1D05   11     4   B05B05                   A
     B16-1B05/1D05  22         B17-1B05/1D05   22     3   B05B05                   A

     B16-1B21/1D21  11         B13-1B24/1D24   11     4   B13B24                   A

     B16-1B22/1D22  11         B13-1B25/1D25   11     4   B13B25                   A

     B16-1B24/1D24  11         B13-1B21/1D21   11     4   B18A88                   A
     B16-1B24/1D24  22         B18-2A38/2C38   22    10   B18A88                   A

     B16-1B25/1D25  11         B19-2B31/2D31   11     9   B16B25                   A

     B16-1B26/1D26  11         B18-2A31/2C31   11     9   B16B26                   A

     B16-1B27/1D27  11         A21-1A41/1C41   11    14   B16B27                   A

     B16-1B28/1D28  11         A21-1B41/1D41   11    14   B16B28                   A

     B16-1B32/1D32  11         B17-2A15/2C15   11     6   B17A65                   A

     B16-1B35/1D35  11         B14-1B04/1D04   11     6   B16B35                   A

     B16-1B36/1D36  11         B17-1B38/1D38   11     3   B17B38                   A

     B16-1B40/1D40  11         B17-1A28/1C28   11     4   B17A83                   A
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      ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

      B16-1B43/1D43  11          B17-2B14/2D14   11     5     B16B43                    A

      B16-2A03/2C03  11          B18-1A13/1C13   11     7     B18A13                    A
      B16-2A03/2C03  22          B15-2A34/2C34   22     6     B18A13                    A

      B16-2A04/2C04  11          B19-1A12/1C12   11     8     B16A54                    A

      B16-2A07/2C07  11          B14-1B08/1D08   11     8     B14B08                    A

      B16-2A08/2C08  11          B19-1B13/1D13   11     8     B19B13                    A

      B16-2A09/2C09  11          B17-2A30/2C30   11     5     B17A80                    A

      B16-2A10/2C10  11          B18-1B26/1D26   11     7     B15B30                    A

      B16-2A11/2C11  11          B17-1A38/1C38   11     5     B17A38                    A

      B16-2A12/2C12  11          B17-1A40/1C40   11     5     B16A62                    A

      B16-2A13/2C13  11          B17-1A30/1C30   11     6     B17A30                    A

      B16-2A14/2C14  11          B18-1B25/1D25   11     7     B15B29                    A

      B16-2A15/2C15  11          B18-1B24/1D24   11     7     B15B28                    A

      B16-2A16/2C16  11          B18-1B28/1D28   11     7     B18B28                    A

      B16-2A17/2C17  11          B17-2B37/2D37   11     5     B17B87                    A

      B16-2A18/2C18  11          B17-2A37/2C37   11     4     B17A87                    A

      B16-2A19/2C19  11          B17-1A32/1C32   11     7     B17A32                    A

      B16-2A22/2C22  11          B14-1A22/1C22   11     8     B17A64                    A
      B16-2A22/2C22  22          B17-2A14/2C14   22     3     B17A64                    A

      B16-2A25/2C25  11          B14-2A05/2C05   11     5     B14A55                    A
      B16-2A25/2C25  22          B17-1B40/1D40   22     7     B14A55                    A

      B16-2A26/2C26  22          B19-1B27/1D27   22     8     B15B27                    A

      B16-2A27/2C27  22          B19-1B26/1D26   22     9     B15B26                    A

      B16-2A28/2C28  11          B17-1B28/1D28   11     8     B17B28                    A

      B16-2A29/2C29  11          B17-1A37/1C37   11     7     B17A37                    A

      B16-2A30/2C30  11          B19-2A17/2C17   11     5     B19A67                    A

      B16-2A31/2C31  22          B19-1B24/1D24   22     9     B15B24                    A

      B16-2A32/2C32  22          B19-1A24/1C24   22     9     B15A24                    A

      B16-2A33/2C33  11          B18-2B30/2D30   11     4     B18B80                    A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B16-2A35/2C35	11	B17-2A42/2C42	11	3	B17A92			A
B16-2A36/2C36	11	B17-1A33/1C33	11	8	B16A86			A
B16-2A37/2C37	11	B17-2A31/2C31	11	3	B16A87			A
B16-2A38/2C38	11	B17-1B07/1D07	11	11	B17B07			A
B16-2A40/2C40	22	B15-1B42/1D42	22	8	B15B42			A
B16-2A41/2C41	11	B14-1B40/1D40	11	8	B14B40			A
B16-2A42/2C42	22	B19-1B21/1D21	22	10	B14A17			A
B16-2A43/2C43	11	B19-2B12/2D12	11	6	B16A93			A
B16-2B03/2D03	11	B17-2B38/2D38	11	6	B16B53			A
B16-2B04/----		B16-2D04/----			GRNDXX			A
B16-2B05/2D05	11	B17-2A32/2C32	11	5	B16B55			A
B16-2B08/2D08	11	B15-2A05/2C05	11	3	B15A55			A
B16-2B09/2D09	11	B18-1B27/1D27	11	6	B15B31			A
B16-2B10/2D10	11	B18-1A27/1C27	11	7	B15A31			A
B16-2B11/2D11	11	B18-1A26/1C26	11	7	B15A30			A
B16-2B12/2D12	11	B17-2B40/2D40	11	5	B16B62			A
B16-2B13/2D13	11	B17-2A43/2C43	11	6	B16B63			A
B16-2B14/2D14	11	B17-1B30/1D30	11	7	B17B30			A
B16-2B15/2D15	11	B18-1A25/1C25	11	7	B15A29			A
B16-2B16/2D16	11	B18-1A24/1C24	11	7	B15A28			A
B16-2B17/2D17	11	B17-2B30/2D30	11	4	B17B80			A
B16-2B18/----		B16-2D18/----			GRNDXX			A
B16-2B21/----		B16-2D21/----			GRNDXX			A
B16-2B22/2D22	11	B19-2A05/2C05	11	5	B16B72			A
B16-2B24/2D24	11	B14-1A40/1C40	11	7	B02B79			A
B16-2B25/2D25	11	B13-1A40/1C40	11	7	B13A40			A
B16-2B26/2D26	11	B05-1B32/1D32	11	11	B05B32			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B16-2B27/2D27	22	B19-1A27/1C27	22	8	B15A27			A
B16-2B28/2D28	22	B19-1A26/1C26	22	9	B15A26			A
B16-2B30/2D30	22	B19-1B25/1D25	22	9	B15B25			A
B16-2B31/2D31	22	B19-1A25/1C25	22	9	B15A25			A
B16-2B32/2D32	11	B19-2B13/2D13	11	5	B19B63			A
B16-2B33/2D33	11	B19-2B03/2D03	11	6	B19B53			A
B16-2B34/2D34	11	B13-1B33/1D33	11	8	B13B33			A
B16-2B35/2D35	11	B17-2A41/2C41	11	3	B17A91			A
B16-2B36/2D36	11	B17-1B33/1D33	11	8	B16B86			A
B16-2B37/2D37	11	B17-1A29/1C29	11	9	B17A29			A
B16-2B38/2D38	11	B19-1B35/1D35	11	9	B16B88			A
B16-2B40/2D40	11	B15-1A43/1C43	11	8	B15A43			A
B16-2B41/2D41	11	B14-2A33/2C33	11	4	B14A83			A
B16-2B41/2D41	22	B17-2A16/2C16	22	5	B14A83			A
B16-2B42/2D42	11	B19-2A12/2C12	11	6	B16B92			A
B16-2B43/2D43	11	B19-1B18/1D18	11	11	B16B93			A

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PAGE   119  PACK        B17
     ORIGIN          LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     B17-1A03/1C03   11         B14-1A03/1C03    11      4    B05A03                    A

     B17-1A04/1C04   11         B21-1B40/1D40    11      7    B05A04                    A
     B17-1A04/1C04   22         B16-1A04/1C04    22      3    B05A04                    A

     B17-1A05/1C05   11         B18-1A05/1C05    11      3    B05A05                    A
     B17-1A05/1C05   22         B09-1A05/1C05    22      7    B05A05                    A

     B17-1A07/1C07   11         B15-1A32/1C32    11      5    B17A07                    A

     B17-1A08/1C08   11         B13-1A08/1C08    11      5    B05A08                    A
     B17-1A08/1C08   22         B21-1A08/1C08    22      5    B05A08                    A

     B17-1A09/1C09   11         B13-1A09/1C09    11      5    B05A09                    A
     B17-1A09/1C09   22         B21-1A09/1C09    22      5    B05A09                    A

     B17-1A10/1C10   11         B13-1A10/1C10    11      5    B05A10                    A
     B17-1A10/1C10   22         B21-1A10/1C10    22      5    B05A10                    A

     B17-1A11/1C11   11         B13-1A11/1C11    11      5    B05A11                    A
     B17-1A11/1C11   22         B21-1A11/1C11    22      5    B05A11                    A

     B17-1A12/1C12   11         B14-2B34/2D34    11     10    B14B84                    A
     B17-1A12/1C12   22         B18-1A12/1C12    22      3    B14B84                    A

     B17-1A13/1C13   11         B14-1B33/1D33    11      5    B17A13                    A

     B17-1A14/1C14   11         B17-1A19/1C19    11      3    B17A14                    A

     B17-1A15/1C15   11         B19-2B26/2D26    11      9    B17A15                    A

     B17-1A16/1C16   11         B13-1A16/1C16    11      5    B05A16                    A
     B17-1A16/1C16   22         B21-1B16/1D16    22      5    B05A16                    A

     B17-1A17/1C17   11         B19-2B34/2D34    11     10    B17A17                    A

     B17-1A18/1C18   11         B19-2A27/2C27    11      9    B17A18                    A

     B17-1A19/1C19   11         B17-1A14/1C14    11      3    B17A14                    A

     B17-1A20/1C20   11         B19-2B30/2D30    11      9    B17A20                    A

     B17-1A21/1C21   11         B15-2A03/2C03    11      6    B17A21                    A

     B17-1A22/1C22   22         B16-1A42/1C42    22      5    B16A42                    A

     B17-1A24/1C24   11         B19-1A24/1C24    11      4    B15A24                    A
     B17-1A24/1C24   22         B15-1A24/1C24    22      4    B15A24                    A

     B17-1A25/1C25   11         B19-1A25/1C25    11      4    B15A25                    A
     B17-1A25/1C25   22         B15-1A25/1C25    22      4    B15A25                    A

     B17-1A26/1C26   11         B19-1A26/1C26    11      4    B15A26                    A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B17-1A26/1C26	22	B15-1A26/1C26	22	4	B15A26			A
B17-1A27/1C27	11	B19-1A27/1C27	11	4	B15A27			A
B17-1A27/1C27	22	B15-1A27/1C27	22	4	B15A27			A
B17-1A28/1C28	11	B16-1B40/1D40	11	4	B17A83			A
B17-1A28/1C28	22	B18-1A28/1C28	22	3	B17A83			A
B17-1A29/1C29	11	B16-2B37/2D37	11	9	B17A29			A
B17-1A30/1C30	11	B16-2A13/2C13	11	6	B17A30			A
B17-1A31/1C31	11	B16-1A21/1C21	11	4	B17A31			A
B17-1A32/1C32	11	B16-2A19/2C19	11	7	B17A32			A
B17-1A33/1C33	11	B16-2A36/2C36	11	8	B16A86			A
B17-1A35/1C35	11	B15-1B35/1D35	11	3	B15B35			A
B17-1A35/1C35	22	B18-1A35/1C35	22	3	B15B35			A
B17-1A36/1C36	11	B18-1A19/1C19	11	4	B17A36			A
B17-1A37/1C37	11	B16-2A29/2C29	11	7	B17A37			A
B17-1A38/1C38	11	B16-2A11/2C11	11	5	B17A38			A
B17-1A40/1C40	11	B16-2A12/2C12	11	5	B16A62			A
B17-1A41/1C41	11	B18-1A41/1C41	11	3	B15B55			A
B17-1A41/1C41	22	B15-2B05/2D05	22	5	B15B55			A
B17-1A42/1C42	11	B14-1B17/1D17	11	5	B14B17			A
B17-1A43/1C43	11	B16-1A33/1C33	11	4	B17A43			A
B17-1B03/1D03	11	B16-1B03/1D03	11	3	B05B03			A
B17-1B03/1D03	22	B21-1A40/1C40	22	7	B05B03			A
B17-1B04/1D04	11	B09-1B04/1D04	11	7	B05B04			A
B17-1B05/1D05	22	B16-1B05/1D05	22	3	B05B05			A
B17-1B07/1D07	11	B16-2A38/2C38	11	11	B17B07			A
B17-1B08/1D08	11	B13-1B08/1D08	11	5	B05B08			A
B17-1B08/1D08	22	B21-1B08/1D08	22	5	B05B08			A
B17-1B09/1D09	11	B13-1B09/1D09	11	5	B05B09			A
B17-1B09/1D09	22	B21-1B09/1D09	22	5	B05B09			A
B17-1B10/1D10	11	B13-1B10/1D10	11	5	B05B10			A
B17-1B10/1D10	22	B21-1B10/1D10	22	5	B05B10			A

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PAGE   121  PACK        B17

     ORIGIN         LEVS      DESTINATION      LEVS  LTH    SIGNAL   CBL   COLORS   REV

     B17-1B11/1C11   11         B13-1B11/1D11   11     5    B05B11                    A
     B17-1B11/1C11   22         B21-1B11/1D11   22     5    B05B11                    A

     B17-1B12/1C12   11         B13-1B38/1D38   11     6    B13B38                    A
     B17-1B12/1C12   22         B18-1B12/1D12   22     3    B13B38                    A

     B17-1B13/1C13   11         B18-1B32/1D32   11     4    B18B32                    A

     B17-1B14/1C14   11         B19-2A26/2C26   11     9    B17B14                    A

     B17-1B15/1C15   11         B19-2B29/2D29   11    10    B17B15                    A

     B17-1B16/1C16   11         B19-2A29/2C29   11     9    B17B16                    A

     B17-1B17/1C17   11         B17-1B34/1D34   11     4    B17B17                    A

     B17-1B18/1C18   11         B15-1A12/1C12   11     4    B17B18                    A

     B17-1B19/1C19   11         B19-2B27/2D27   11     9    B17B19                    A

     B17-1B20/1C20   11         B17-2B25/2D25   11     9    B17B75                    A

     B17-1B21/1C21   11         B19-2A30/2C30   11     9    B17B21                    A

     B17-1B24/1C24   11         B19-1B24/1D24   11     4    B15B24                    A
     B17-1B24/1C24   22         B15-1B24/1C24   22     4    B15B24                    A

     B17-1B25/1C25   11         B19-1B25/1C25   11     4    B15B25                    A
     B17-1B25/1C25   22         B15-1B25/1D25   22     4    B15B25                    A

     B17-1B26/1C26   11         B19-1B26/1D26   11     4    B15B26                    A
     B17-1B26/1C26   22         B15-1B26/1D26   22     4    B15B26                    A

     B17-1B27/1C27   11         B19-1B27/1D27   11     4    B15B27                    A
     B17-1B27/1C27   22         B15-1B27/1C27   22     4    B15B27                    A

     B17-1B28/1C28   11         B16-2A28/2C28   11     8    B17B28                    A

     B17-1B30/1C30   11         B16-2B14/2D14   11     7    B17B30                    A

     B17-1B33/1C33   11         B16-2B36/2D36   11     8    B16B86                    A

     B17-1B34/1C34   11         B17-1B17/1D17   11     4    B17B17                    A
     B17-1B34/1C34   22         B18-1B34/1D34   22     3    B17B17                    A

     B17-1B36/1C36   11         B18-1B37/1C37   11     3    B18B37                    A

     B17-1B38/1C38   11         B16-1B36/1D36   11     3    B17B38                    A

     B17-1B40/1C40   22         B16-2A25/2C25   22     7    B14A55                    A

     B17-1B41/1C41   11         B15-1A40/1C40   11     4    B15A40                    A

     B17-1B42/1C42   11         B15-2B20/2D20   11     6    B15B70                    A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B17-1B43/1D43	11	B16-1A36/1C36	11	4	B17B43			A
B17-2A04/2C04	11	B19-1B37/1D37	11	5	B19B37			A
B17-2A05/2C05	11	B19-1A40/1C40	11	5	B19A40			A
B17-2A07/2C07	11	B19-2A07/2C07	11	4	B15A57			A
B17-2A07/2C07	22	B15-2A07/2C07	22	4	B15A57			A
B17-2A08/2C08	11	B19-2A08/2C08	11	4	B15A58			A
B17-2A08/2C08	22	B15-2A08/2C08	22	4	B15A58			A
B17-2A09/2C09	11	B19-2A09/2C09	11	4	B15A59			A
B17-2A09/2C09	22	B15-2A09/2C09	22	4	B15A59			A
B17-2A10/2C10	11	B19-2A10/2C10	11	4	B15A60			A
B17-2A10/2C10	22	B15-2A10/2C10	22	4	B15A60			A
B17-2A11/2C11	11	B19-1A38/1C38	11	6	B19A38			A
B17-2A12/2C12	11	B19-1B42/1D42	11	5	B19B42			A
B17-2A13/2C13	11	B15-2A17/2C17	11	4	B17A63			A
B17-2A14/2C14	22	B16-2A22/2C22	22	3	B17A64			A
B17-2A15/2C15	11	B16-1B32/1D32	11	6	B17A65			A
B17-2A16/2C16	22	B16-2B41/2D41	22	5	B14A83			A
B17-2A17/2C17	11	B18-2A17/2C17	11	3	B15B41			A
B17-2A17/2C17	22	B14-1B36/1D36	22	7	B15B41			A
B17-2A18/2C18	11	B14-1A38/1C38	11	7	B14A38			A
B17-2A24/2C24	11	B19-1B10/1D10	11	10	B19B10			A
B17-2A25/2C25	11	B18-1B20/1D20	11	9	B17A75			A
B17-2A27/----		B17-2C27/----			GRNDXX			A
B17-2A30/2C30	11	B16-2A09/2C09	11	5	B17A80			A
B17-2A31/2C31	11	B16-2A37/2C37	11	3	B16A87			A
B17-2A32/2C32	11	B16-2B05/2D05	11	5	B16B55			A
B17-2A33/2C33	22	B19-2A16/2C16	22	5	B17A83			A
B17-2A34/2C34	11	B14-2A34/2C34	11	4	B05A84			A
B17-2A34/2C34	22	B21-1A43/1C43	22	8	B05A84			A
B17-2A35/----		B17-2C35/----			GRNDXX			A

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PAGE   123  PACK        B17
     ORIGIN         LEVS       DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B17-2A37/2C37   11         B16-2A18/2C18   11     4   B17A87                 A

     B17-2A40/2C40   11         B16-1A40/1C40   11     8   B17A90                 A

     B17-2A41/2C41   11         B16-2B35/2D35   11     3   B17A91                 A

     B17-2A42/2C42   11         B16-2A35/2C35   11     3   B17A92                 A

     B17-2A43/2C43   11         B16-2B13/2D13   11     6   B16B63                 A

     B17-2B03/2D03   11         B15-2A20/2C20   11     5   B15A70                 A
     B17-2B03/2D03   22         B18-2B03/2D03   22     3   B15A70                 A

     B17-2B04/2D04   11         B19-1B41/1D41   11     5   B19B41                 A

     B17-2B05/2D05   11         B19-1B40/1D40   11     5   B19B40                 A

     B17-2B07/2D07   11         B19-2B07/2D07   11     4   B15B57                 A
     B17-2B07/2D07   22         B15-2B07/2D07   22     4   B15B57                 A

     B17-2B08/2D08   11         B19-2B08/2D08   11     4   B15B58                 A
     B17-2B08/2D08   22         B15-2B08/2D08   22     4   B15B58                 A

     B17-2B09/2D09   11         B19-2B09/2D09   11     4   B15B59                 A
     B17-2B09/2D09   22         B15-2B09/2D09   22     4   B15B59                 A

     B17-2B10/2D10   11         B19-2B10/2D10   11     4   B15B60                 A
     B17-2B10/2D10   22         B15-2B10/2D10   22     4   B15B60                 A

     B17-2B11/2D11   11         B19-1A41/1C41   11     5   B19A41                 A

     B17-2B12/2D12   11         B19-1A42/1C42   11     5   B19A42                 A

     B17-2B13/2D13   11         B15-2A21/2C21   11     4   B15A71                 A
     B17-2B13/2D13   22         B19-1B12/1D12   22     8   B15A71                 A

     B17-2B14/2D14   11         B16-1B43/1D43   11     5   B16B43                 A
     B17-2B14/2D14   22         B18-2B14/2D14   22     3   B16B43                 A

     B17-2B15/2D15   11         B15-2A22/2C22   11     4   B15A72                 A
     B17-2B15/2D15   22         B18-2B15/2D15   22     3   B15A72                 A

     B17-2B16/2D16   11         B18-2B16/2D16   11     3   B15B37                 A
     B17-2B16/2D16   22         B14-1A33/1C33   22     7   B15B37                 A

     B17-2B17/2D17   11         B18-2B17/2D17   11     3   B15A41                 A
     B17-2B17/2D17   22         B14-1A36/1C36   22     7   B15A41                 A

     B17-2B18/2D18   11         B18-2B18/2D18   11     3   B15A42                 A
     B17-2B18/2D18   22         B14-1A37/1C37   22     7   B15A42                 A

     B17-2B22/2D22   11         B19-1A37/1C37   11     7   B19A37                 A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B17-2B25/2C25	11	B17-1B20/1D20	11	9	B17B75			A
B17-2B27/----		B17-2D27/----			GRNDXX			A
B17-2B28/2C28	11	B19-2A03/2C03	11	5	B19A53			A
B17-2B29/2C29	11	B18-2A29/2C29	11	3	B18A79			A
B17-2B30/2C30	11	B16-2B17/2D17	11	4	B17B80			A
B17-2B31/2C31	11	B18-2B31/2D31	11	3	B05B81			A
B17-2B31/2C31	22	B15-2B31/2D31	22	4	B05B81			A
B17-2B32/2C32	11	B14-1A35/1C35	11	8	B14A35			A
B17-2B33/2C33	22	B13-1B34/1D34	22	6	B05B83			A
B17-2B34/2C34	11	B10-2B34/2D34	11	7	B05B84			A
B17-2B36/2C36	11	B15-2A27/2C27	11	4	B15A77			A
B17-2B36/2C36	22	B18-2B36/2C36	22	3	B15A77			A
B17-2B37/2C37	11	B16-2A17/2C17	11	5	B17B87			A
B17-2B38/2C38	11	B16-2B03/2D03	11	6	B16B53			A
B17-2B38/2C38	22	B18-2B38/2C38	22	3	B16B53			A
B17-2B40/2C40	11	B16-2B12/2D12	11	5	B16B62			A

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PAGE   125  PACK        B18
     ORIGIN          LEVS      DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B18-1AC5/1CC5   11         B17-1AC5/1C05   11     3    B05A05                 A

     B18-1AC8/1CC8   11         B13-1A12/1C12   11     6    B05A12                 A
     B18-1AC8/1CC8   22         B21-1A12/1C12   22     4    B05A12                 A

     B18-1AC9/1CC9   11         B13-1A13/1C13   11     6    B05A13                 A
     B18-1AC9/1CC9   22         B21-1A13/1C13   22     4    B05A13                 A

     B18-1A10/1C10   11         B13-1A14/1C14   11     6    BC5A14                 A
     B18-1A10/1C10   22         B21-1A14/1C14   22     4    B05A14                 A

     B18-1A11/1C11   11         B13-1A15/1C15   11     6    B05A15                 A
     B18-1A11/1C11   22         B21-1A15/1C15   22     4    BC5A15                 A

     B18-1A12/1C12   22         B17-1A12/1C12   22     3    B14B84                 A

     B18-1A13/1C13   11         B16-2AC3/2C03   11     7    B18A13                 A

     B18-1A15/1C15   11         B19-1B14/1D14   11     3    B18A15                 A

     B18-1A16/1C16   11         B13-1B16/1D16   11     5    B05B16                 A
     B18-1A16/1C16   22         B21-1A16/1C16   22     4    B05B16                 A

     B18-1A17/1C17   11         B19-1A11/1C11   11     3    B18A17                 A

     B18-1A18/1C18   11         B19-1B19/1D19   11     3    B18A18                 A

     B18-1A19/1C19   11         B17-1A36/1C36   11     4    B17A36                 A

     B18-1A20/1C20   11         B19-1B20/1D20   11     3    B18A20                 A

     B18-1A24/1C24   11         B16-2B16/2D16   11     7    B15A28                 A
     B18-1A24/1C24   22         B15-1A28/1C28   22     4    B15A28                 A

     B18-1A25/1C25   11         B16-2B15/2D15   11     7    B15A29                 A
     B18-1A25/1C25   22         B15-1A29/1C29   22     4    B15A29                 A

     B18-1A26/1C26   11         B16-2B11/2D11   11     7    B15A30                 A
     B18-1A26/1C26   22         B15-1A30/1C30   22     4    B15A30                 A

     B18-1A27/1C27   11         B16-2B10/2D10   11     7    B15A31                 A
     B18-1A27/1C27   22         B15-1A31/1C31   22     4    B15A31                 A

     B18-1A28/1C28   11         B19-2A16/2C16   11     7    B17A83                 A
     B18-1A28/1C28   22         B17-1A28/1C28   22     3    B17A83                 A

     B18-1A35/1C35   22         B17-1A35/1C35   22     3    B15B35                 A

     B18-1A40/----              B18-1C40/----               GRNDXX                 A

     B18-1A41/1C41   11         B17-1A41/1C41   11     3    B15B55                 A

     B18-1BC8/1D08   11         B13-1B12/1D12   11     6    B05B12                 A
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PAGE   126  PACK        B18

     ORIGIN          LEVS       DESTINATION       LEVS  LTH   SIGNAL   CBL   COLORS   REV

     B18-1B08/1D08   22           B21-1B12/1D12   22     4    B05B12                   A

     B18-1B09/1D09   11           B13-1B13/1D13   11     6    B05B13                   A
     B18-1B09/1D09   22           B21-1B13/1D13   22     4    B05B13                   A

     B18-1B10/1D10   11           B13-1B14/1D14   11     6    B05B14                   A
     B18-1B10/1D10   22           B21-1B14/1D14   22     4    B05B14                   A

     B18-1B11/1D11   11           B13-1B15/1D15   11     6    B05B15                   A
     B18-1B11/1D11   22           B21-1B15/1D15   22     4    B05B15                   A

     B18-1B12/1D12   22           B17-1B12/1D12   22     3    B13B38                   A

     B18-1B14/1D14   11           B19-1A13/1C13   11     3    B18B14                   A

     B18-1B15/1D15   11           B19-1A14/1C14   11     3    B18B15                   A

     B18-1B16/1D16   11           B19-1B15/1D15   11     3    B18B16                   A

     B18-1B19/1D19   11           B19-1A19/1C19   11     3    B18B19                   A

     B18-1B20/1D20   11           B17-2A25/2C25   11     9    B17A75                   A

     B18-1B21/1D21   11           B19-1A20/1C20   11     3    B18B21                   A

     B18-1B24/1D24   11           B16-2A15/2C15   11     7    B15B28                   A
     B18-1B24/1D24   22           B15-1B28/1D28   22     4    B15B28                   A

     B18-1B25/1D25   11           B16-2A14/2C14   11     7    B15B29                   A
     B18-1B25/1D25   22           B15-1B29/1D29   22     4    B15B29                   A

     B18-1B26/1D26   11           B16-2A10/2C10   11     7    B15B30                   A
     B18-1B26/1D26   22           B15-1B30/1D30   22     4    B15B30                   A

     B18-1B27/1D27   11           B16-2B09/2D09   11     6    B15B31                   A
     B18-1B27/1D27   22           B15-1B31/1D31   22     4    B15B31                   A

     B18-1B28/1D28   11           B16-2A16/2C16   11     7    B18B28                   A

     B18-1B32/1D32   11           B17-1B13/1D13   11     4    B18B32                   A

     B18-1B34/1D34   22           B17-1B34/1D34   22     3    B17B17                   A

     B18-1B37/1D37   11           B17-1B36/1D36   11     3    B18B37                   A

     B18-1B41/1D41   11           B15-1B38/1D38   11     4    B15B38                   A

     B18-2A04/2C04   11           B19-2B32/2D32   11     5    B19B82                   A

     B18-2A05/2C05   11           B19-2A38/2C38   11     6    B19A88                   A

     B18-2A07/2C07   22           B15-2A11/2C11   22     4    B15A61                   A

     B18-2A08/2C08   22           B15-2A12/2C12   22     4    B15A62                   A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B18-2A09/2C09	22	B15-2A13/2C13	22	4	B15A63			A
B18-2A10/2C10	22	B15-2A14/2C14	22	4	B15A64			A
B18-2A11/2C11	11	B19-2A35/2C35	11	5	B19A85			A
B18-2A12/2C12	11	B19-2B40/2D40	11	5	B19B90			A
B18-2A17/2C17	11	B17-2A17/2C17	11	3	B15B41			A
B18-2A27/----		B18-2C27/----			GRNDXX			A
B18-2A29/2C29	11	B17-2B29/2D29	11	3	B18A79			A
B18-2A31/2C31	11	B16-1B26/1D26	11	9	B16B26			A
B18-2A35/----		B18-2C35/----			GRNDXX			A
B18-2A38/2C38	22	B16-1B24/1D24	22	10	B18A88			A
B18-2B03/2D03	22	B17-2B03/2D03	22	3	B15A70			A
B18-2B04/2D04	11	B19-2A32/2C32	11	5	B19A82			A
B18-2B05/2D05	11	B19-2A36/2C36	11	6	B19A86			A
B18-2B07/2D07	22	B15-2B11/2D11	22	4	B15B61			A
B18-2B08/2D08	22	B15-2B12/2D12	22	4	B15B62			A
B18-2B09/2D09	22	B15-2B13/2D13	22	4	B15B63			A
B18-2B10/2D10	22	B15-2B14/2D14	22	4	B15B64			A
B18-2B11/2D11	11	B19-2B42/2D42	11	6	B19B92			A
B18-2B12/2D12	11	B19-2B38/2D38	11	5	B19B88			A
B18-2B14/2D14	22	B17-2B14/2D14	22	3	B16B43			A
B18-2B15/2D15	22	B17-2B15/2D15	22	3	B15A72			A
B18-2B16/2D16	11	B17-2B16/2D16	11	3	B15B37			A
B18-2B17/2D17	11	B17-2B17/2D17	11	3	B15A41			A
B18-2B18/2D18	11	B17-2B18/2D18	11	3	B15A42			A
B18-2B22/2D22	11	B19-2A33/2C33	11	4	B19A83			A
B18-2B27/----		B18-2D27/----			GRNDXX			A
B18-2B28/2D28	11	B19-1A10/1C10	11	10	B19A10			A

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PAGE   128  PACK        B18
     ORIGIN          LEVS      DESTINATION      LEVS  LTH   SIGNAL  CBL  COLORS  REV

     B18-2B30/2C30   11         B16-2A33/2C33   11      4   B18B80                 A

     B18-2B31/2C31   11         B17-2B31/2D31   11      3   B05B81                 A
     B18-2B31/2C31   22         B21-2B19/2D19   22      5   B05B81                 A

     B18-2B36/2C36   22         B17-2B36/2D36   22      3   B15A77                 A

     B18-2B38/2C38   22         B17-2B38/2D38   22      3   B16B53                 A
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PAGE   129  PACK        B19
     ORIGIN         LEVS      DESTINATION     LEVS  LTH   SIGNAL   CBL  COLORS  REV

     B19-1A09/1C09   11        B13-1A22/1C22   11     6   B13A22                  A

     B19-1A10/1C10   11        B18-2B28/2D28   11    10   B19A10                  A

     B19-1A11/1C11   11        B18-1A17/1C17   11     3   B18A17                  A

     B19-1A12/1C12   11        B16-2A04/2C04   11     8   B16A54                  A

     B19-1A13/1C13   11        B18-1B14/1D14   11     3   B18B14                  A

     B19-1A14/1C14   11        B18-1B15/1D15   11     3   B18B15                  A

     B19-1A16/1C16   11        B13-1B26/1D26   11     6   B13B26                  A

     B19-1A17/1C17   11        B13-1B27/1D27   11     6   B13B27                  A

     B19-1A18/1C18   11        B13-1B28/1D28   11     6   B13B28                  A

     B19-1A19/1C19   11        B18-1B19/1D19   11     3   B18B19                  A

     B19-1A20/1C20   11        B18-1B21/1D21   11     3   B18B21                  A

     B19-1A21/1C21   11        B15-2A33/2C33   11    10   B15A83                  A

     B19-1A22/1C22   11        B15-1A35/1C35   11     5   B15A35                  A

     B19-1A24/1C24   11        B17-1A24/1C24   11     4   B15A24                  A
     B19-1A24/1C24   22        B16-2A32/2C32   22     9   B15A24                  A

     B19-1A25/1C25   11        B17-1A25/1C25   11     4   B15A25                  A
     B19-1A25/1C25   22        B16-2B31/2D31   22     9   B15A25                  A

     B19-1A26/1C26   11        B17-1A26/1C26   11     4   B15A26                  A
     B19-1A26/1C26   22        B16-2B28/2D28   22     9   B15A26                  A

     B19-1A27/1C27   11        B17-1A27/1C27   11     4   B15A27                  A
     B19-1A27/1C27   22        B16-2B27/2D27   22     8   B15A27                  A

     B19-1A28/1C28   11        B13-1A24/1C24   11     6   B13A24                  A

     B19-1A29/1C29   11        B13-1A25/1C25   11     6   B13A25                  A

     B19-1A30/1C30   11        B16-1A32/1C32   11     4   B16A32                  A

     B19-1A31/1C31   11        B13-1A26/1C26   11     6   B13A26                  A

     B19-1A32/1C32   11        B13-1A27/1C27   11     6   B13A27                  A

     B19-1A33/1C33   11        B13-1A28/1C28   11     6   B13A28                  A

     B19-1A34/1C34   11        B13-1B30/1D30   11     6   B13B30                  A

     B19-1A37/1C37   11        B17-2B22/2D22   11     7   B19A37                  A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B19-1A38/1C38	11	B17-2A11/2C11	11	6	B19A38			A
B19-1A40/1C40	11	B17-2A05/2C05	11	5	B19A40			A
B19-1A41/1C41	11	B17-2B11/2D11	11	5	B19A41			A
B19-1A42/1C42	11	B17-2B12/2D12	11	5	B19A42			A
B19-1B04/----		B19-1D04/----			GRNDXX			A
B19-1B08/----		B19-1D08/----			GRNDXX			A
B19-1B10/1D10	11	B17-2A24/2C24	11	10	B19B10			A
B19-1B12/1D12	22	B17-2B13/2D13	22	6	B15A71			A
B19-1B13/1D13	11	B16-2A08/2C08	11	8	B19B13			A
B19-1B14/1D14	11	B18-1A15/1C15	11	3	B18A15			A
B19-1B15/1D15	11	B18-1B16/1D16	11	3	B18B16			A
B19-1B16/----		B19-1D16/----			GRNDXX			A
B19-1B18/1D18	11	B16-2B43/2D43	11	11	B16B93			A
B19-1B19/1D19	11	B18-1A18/1C18	11	3	B18A18			A
B19-1B20/1D20	11	B18-1A20/1C20	11	3	B18A20			A
B19-1B21/1D21	11	B14-1A17/1C17	11	6	B14A17			A
B19-1B21/1D21	22	B16-2A42/2C42	22	10	B14A17			A
B19-1B22/1D22	11	B15-2B33/2D33	11	10	B15B83			A
B19-1B24/1D24	11	B17-1B24/1D24	11	4	B15B24			A
B19-1B24/1D24	22	B16-2A31/2C31	22	9	B15B24			A
B19-1B25/1D25	11	B17-1B25/1D25	11	4	B15B25			A
B19-1B25/1D25	22	B16-2B30/2D30	22	9	B15B25			A
B19-1B26/1D26	11	B17-1B26/1D26	11	4	B15B26			A
B19-1B26/1D26	22	B16-2A27/2C27	22	9	B15B26			A
B19-1B27/1D27	11	B17-1B27/1D27	11	4	B15B27			A
B19-1B27/1D27	22	B16-2A26/2C26	22	8	B15B27			A
B19-1B30/1D30	11	B14-1A34/1C34	11	6	B14A34			A
B19-1B33/1D33	11	B14-1B34/1D34	11	6	B14B34			A
B19-1B35/1D35	11	B16-2B38/2D38	11	9	B16B88			A

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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B19-1B37/1C37	11	B17-2A04/2C04	11	5	B19B37			A
B19-1B40/1C40	11	B17-2B05/2D05	11	5	B19B40			A
B19-1B41/1C41	11	B17-2B04/2D04	11	5	B19B41			A
B19-1B42/1C42	11	B17-2A12/2C12	11	5	B19B42			A
B19-2A03/2C03	11	B17-2B28/2D28	11	5	B19A53			A
B19-2A05/2C05	11	B16-2B22/2D22	11	5	B16B72			A
B19-2A07/2C07	11	B17-2A07/2C07	11	4	B15A57			A
B19-2A08/2C08	11	B17-2A08/2C08	11	4	B15A58			A
B19-2A09/2C09	11	B17-2A09/2C09	11	4	B15A59			A
B19-2A10/2C10	11	B17-2A10/2C10	11	4	B15A60			A
B19-2A12/2C12	11	B16-2B42/2D42	11	6	B16B92			A
B19-2A16/2C16	11	B18-1A28/1C28	11	7	B17A83			A
B19-2A16/2C16	22	B17-2A33/2C33	22	5	B17A83			A
B19-2A17/2C17	11	B16-2A30/2C30	11	5	B19A67			A
B19-2A26/2C26	11	B17-1B14/1D14	11	9	B17B14			A
B19-2A27/2C27	11	B17-1A18/1C18	11	9	B17A18			A
B19-2A29/2C29	11	B17-1B16/1D16	11	9	B17B16			A
B19-2A30/2C30	11	B17-1B21/1D21	11	9	B17B21			A
B19-2A32/2C32	11	B18-2B04/2D04	11	5	B19A82			A
B19-2A33/2C33	11	B18-2B22/2D22	11	4	B19A83			A
B19-2A35/2C35	11	B18-2A11/2C11	11	5	B19A85			A
B19-2A36/2C36	11	B18-2B05/2D05	11	6	B19A86			A
B19-2A38/2C38	11	B18-2A05/2C05	11	6	B19A88			A
B19-2A41/2C41	11	B14-2A03/2C03	11	7	B14A53			A
B19-2A43/2C43	11	B15-2A24/2C24	11	6	B15A74			A
B19-2B03/2D03	11	B16-2B33/2D33	11	6	B19B53			A
B19-2B07/2D07	11	B17-2B07/2D07	11	4	B15B57			A
B19-2B08/2D08	11	B17-2B08/2D08	11	4	B15B58			A

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PAGE   132  PACK        B19
     ORIGIN         LEVS      DESTINATION     LEVS  LTH   SIGNAL   CBL  COLORS  REV

     B19-2B09/2D09  11        B17-2B09/2D09   11     4    B15B59                 A
     B19-2B10/2D10  11        B17-2B10/2D10   11     4    B15B60                 A
     B19-2B11/2D11  11        B15-2B21/2D21   11     5    B15B71                 A
     B19-2B12/2D12  11        B16-2A43/2C43   11     6    B16A93                 A
     B19-2B13/2D13  11        B16-2B32/2D32   11     5    B19B63                 A
     B19-2B16/----            B19-2D16/----               GRNDXX                 A
     B19-2B17/2D17  11        B15-2B24/2D24   11     5    B15B74                 A
     B19-2B18/----            B19-2D18/----               GRNDXX                 A
     B19-2B20/2D20  11        B15-2A25/2C25   11     5    B15A75                 A
     B19-2B26/2D26  11        B17-1A15/1C15   11     9    B17A15                 A
     B19-2B27/2D27  11        B17-1B19/1D19   11     9    B17B19                 A
     B19-2B29/2D29  11        B17-1B15/1D15   11    10    B17B15                 A
     B19-2B30/2D30  11        B17-1A20/1C20   11     9    B17A20                 A
     B19-2B31/2D31  11        B16-1B25/1D25   11     9    B16B25                 A
     B19-2B32/2D32  11        B18-2A04/2C04   11     5    B19B82                 A
     B19-2B33/2D33  11        B14-2A04/2C04   11     7    B14A54                 A
     B19-2B34/2D34  11        B17-1A17/1C17   11    10    B17A17                 A
     B19-2B35/2D35  11        B15-2B26/2D26   11     5    B15B76                 A
     B19-2B36/2D36  11        B15-2B34/2D34   11     5    B15B84                 A
     B19-2B37/----            B19-2D37/----               GRNDXX                 A
     B19-2B38/2D38  11        B18-2B12/2D12   11     5    B19B88                 A
     B19-2B40/2D40  11        B18-2A12/2C12   11     5    B19B90                 A
     B19-2B42/2D42  11        B18-2B11/2D11   11     6    B19B92                 A
     B19-2B43/2D43  11        B14-2B03/2D03   11     7    B14B53                 A
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ORIGIN	LEVS	DESTINATION	LEVS	LTH	SIGNAL	CBL	COLORS	REV
B21-1A08/1C08	11	A21-1A17/1C17	11	14	B05A08			A
B21-1A08/1C08	22	B17-1A08/1C08	22	5	B05A08			A
B21-1A09/1C09	11	A21-1A18/1C18	11	14	B05A09			A
B21-1A09/1C09	22	B17-1A09/1C09	22	5	B05A09			A
B21-1A10/1C10	11	A21-1A19/1C19	11	14	B05A10			A
B21-1A10/1C10	22	B17-1A10/1C10	22	5	B05A10			A
B21-1A11/1C11	11	A21-1A20/1C20	11	14	B05A11			A
B21-1A11/1C11	22	B17-1A11/1C11	22	5	B05A11			A
B21-1A12/1C12	11	A21-1A21/1C21	11	14	B05A12			A
B21-1A12/1C12	22	B18-1A08/1C08	22	4	B05A12			A
B21-1A13/1C13	11	A21-1A22/1C22	11	14	B05A13			A
B21-1A13/1C13	22	B18-1A09/1C09	22	4	B05A13			A
B21-1A14/1C14	11	A21-1A24/1C24	11	14	B05A14			A
B21-1A14/1C14	22	B18-1A10/1C10	22	4	B05A14			A
B21-1A15/1C15	11	A21-1A25/1C25	11	14	B05A15			A
B21-1A15/1C15	22	B18-1A11/1C11	22	4	B05A15			A
B21-1A16/1C16	11	A21-1A26/1C26	11	14	B05B16			A
B21-1A16/1C16	22	B18-1A16/1C16	22	4	B05B16			A
B21-1A36/1C36	11	A21-1A37/1C37	11	15	B07A17			A
B21-1A36/1C36	22	B09-2A13/2C13	22	10	B07A17			A
B21-1A40/1C40	22	B17-1B03/1D03	22	7	B05B03			A
B21-1A43/1C43	11	A21-1B43/1D43	11	15	B17B43			A
B21-1A43/1C43	22	B17-2A34/2C34	22	6	B05A84			A
B21-1B08/1D08	11	A21-1B17/1D17	11	14	B05B08			A
B21-1B08/1D08	22	B17-1B08/1D08	22	5	B05B08			A
B21-1B09/1D09	11	A21-1B18/1D18	11	14	B05B09			A
B21-1B09/1D09	22	B17-1B09/1D09	22	5	B05B09			A
B21-1B10/1D10	11	A21-1B19/1D19	11	14	B05B10			A
B21-1B10/1D10	22	B17-1B10/1D10	22	5	B05B10			A
B21-1B11/1D11	11	A21-1B20/1D20	11	14	B05B11			A
B21-1B11/1D11	22	B17-1B11/1D11	22	5	B05B11			A
B21-1B12/1D12	11	A21-1B21/1D21	11	14	B05B12			A
B21-1B12/1D12	22	B18-1B08/1D08	22	4	B05B12			A
B21-1B13/1D13	11	A21-1B22/1D22	11	14	B05B13			A
B21-1B13/1D13	22	B18-1B09/1D09	22	4	B05B13			A

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PAGE   134  PACK         B21

     ORIGIN         LEVS       DESTINATION      LEVS  LTH    SIGNAL   CBL  COLORS   REV

     B21-1B14/1C14   11          A21-1B24/1D24   11    14    B05B14                   A
     B21-1B14/1C14   22          B18-1B10/1D10   22     4    B05B14                   A

     B21-1B15/1C15   11          A21-1B25/1D25   11    14    B05B15                   A
     B21-1B15/1C15   22          B18-1B11/1D11   22     4    B05B15                   A

     B21-1B16/1C16   11          A21-1B26/1D26   11    14    B05A16                   A
     B21-1B16/1C16   22          B17-1A16/1C16   22     5    B05A16                   A

     B21-1B36/1C36   11          A21-1B37/1D37   11    15    B18B37                   A
     B21-1B36/1C36   22          B09-2B13/2C13   22    10    B09B63                   A

     B21-1B40/1C40   11          B17-1A04/1C04   11     7    B05A04                   A

     B21-2A18/2C18   11          A21-2A19/2C19   11    15    B13B37                   A
     B21-2A18/2C18   22          B13-1B37/1C37   22     8    B13B37                   A

     B21-2A35/2C35   11          A21-2A27/2C27   11    16    B05A85                   A
     B21-2A35/2C35   22          B15-2A35/2C35   22     6    B05A85                   A

     B21-2A36/2C36   11          A21-2A28/2C28   11    16    B05A86                   A
     B21-2A36/2C36   22          B15-2A36/2C36   22     6    B05A86                   A

     B21-2A37/2C37   11          A21-2A29/2C29   11    16    B05A87                   A
     B21-2A37/2C37   22          B15-2A37/2C37   22     6    B05A87                   A

     B21-2A38/2C38   11          A21-2A30/2C30   11    16    B05A88                   A
     B21-2A38/2C38   22          B15-2A38/2C38   22     6    B05A88                   A

     B21-2A40/2C40   11          A21-2A31/2C31   11    16    B05A90                   A
     B21-2A40/2C40   22          B15-2A40/2C40   22     6    B05A90                   A

     B21-2A41/2C41   11          A21-2A32/2C32   11    16    B05A91                   A
     B21-2A41/2C41   22          B15-2A41/2C41   22     6    B05A91                   A

     B21-2A42/2C42   11          A21-2A33/2C33   11    16    B05A92                   A
     B21-2A42/2C42   22          B15-2A42/2C42   22     6    B05A92                   A

     B21-2A43/2C43   11          A21-2A34/2C34   11    16    B05A93                   A
     B21-2A43/2C43   22          B15-2A43/2C43   22     6    B05A93                   A

     B21-2B19/2C19   11          A21-2B18/2D18   11    15    B05B81                   A
     B21-2B19/2C19   22          B18-2B31/2D31   22     5    B05B81                   A

     B21-2B35/2C35   11          A21-2B27/2D27   11    16    B05B85                   A
     B21-2B35/2C35   22          B15-2B35/2D35   22     6    B05B85                   A

     B21-2B36/2C36   11          A21-2B28/2D28   11    16    B05B86                   A
     B21-2B36/2C36   22          B15-2B36/2D36   22     6    B05B86                   A

     B21-2B37/2C37   11          A21-2B29/2D29   11    16    B05B87                   A
     B21-2B37/2C37   22          B15-2B37/2D37   22     6    B05B87                   A

     B21-2B38/2C38   11          A21-2B30/2D30   11    16    B05B88                   A
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PAGE   135  PACK        B21

     ORIGIN         LEVS      DESTINATION     LEVS  LTH   SIGNAL   CBL  COLORS  REV

     B21-2B38/2D38  22          B15-2B38/2D38  22     6   B05888                  A

     B21-2B40/2D40  11          A21-2B31/2D31  11    16   B05890                  A
     B21-2B40/2D40  22          B15-2B40/2D40  22     6   B05890                  A

     B21-2B41/2D41  11          A21-2B32/2D32  11    16   B05891                  A
     B21-2B41/2D41  22          B15-2B41/2D41  22     6   B05891                  A

     B21-2B42/2D42  11          A21-2B33/2D33  11    16   B05892                  A
     B21-2B42/2D42  22          B15-2B42/2D42  22     6   B05892                  A

     B21-2B43/2D43  11          A21-2B34/2D34  11    16   B05893                  A
     B21-2B43/2D43  22          B15-2B43/2D43  22     6   B05893                  A
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DWN	P. SATHER	6/15/84	CONTROL DATA CORPORATION ARHOPS	TITLE CABLE TABS - CCC I/O, FIPS I/F METRIC	PREFIX A	DOCUMENT NO. 67185231
CHKD		6/18/84				
ENG		7/17/84				
MFG		07/26/84				
APPR		7/13/84	CODE IDENT	FIRST USED ON FR205-A, FV720-A		SHEET 1 OF 9

REV. B

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SHEET REVISION STATUS

9	8	7	6	5	4	3	2	1
A	A	A	A	A	A	A	A	A
B	A	B	A	B	A	B	A	B

REVISION RECORD

REV	ECO	DESCRIPTION	DRFT	DATE	APP
A	—	CLASS A	PS	6/15/84	
B	CA 46746	SEE C.O.	lch	6/11/85	PC

NOTES:
1. J1 AND J2 ARE USED WITH FR205-A.
2. J3 and J4 ARE USED WITH FV720-A.
3. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE MM.

INTER-DIVISIONAL DOCUMENT
Changes to this document require approval of all Using Divisions per CDC-STD 1.01.024. PF

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DETACHED LISTS

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CONTROL DATA CORPORATION	CABLE TABS - CCC I/O, FIPS I/F METRIC	CODE IDENT	SHEET 2 of 9	A	DOCUMENT NO. 67185231	REV. A

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS CHANNEL A TAG
		26	6	1000	J01	B02		A16 2D	29		GND
			2			B03		A16 2B	29		OPL IN
			6			B04		A16 2C	24		GND
			2			B05		A16 2A	24		ADR IN
			6			B07		A16 2D	19		GND
			2			B08		A16 2B	19		SEL IN
			6			B09		A18 2C	28		GND
			2			B10		A18 2A	28		ADR OUT
			6			B13		A18 2D	21		GND
			2			B12		A18 2B	21		SUP OUT
			6			D05		A16 2C	21		GND
			2			D04		A15 2A	21		STA IN
			6			D07		A16 1D	42		GND
			2			D06		A16 1B	42		SRV IN
			6			D08		A18 2C	22		GND
			2			D09		A18 2A	22		SEL OUT
			6			D10		A17 2C	22		GND
			2			D11		A17 2A	22		CMD OUT
			6			D12		A17 2D	20		GND
		26	2	1000	J01	D13		A17 2B	20		SRV OUT

CONTROL DATA CORPORATION	CABLE TABS - CCC I/O, FIPS I/F METRIC	CODE IDENT	SHEET 3 of 9	A.	DOCUMENT NO. 67185231	REV. B

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO	DESTINATION		ACCESS FIND NO	REMARKS CHANNEL A TAG
		26	6	1000	J01	G02		A17 2D	21		GND
			2			G03		A17 2E	21		CLK OUT
			6			G04		A16 -1C	43		GND
			2			G05		A16 -1A	43		MTR IN
			6			G07		A16 -2D	20		GND
			2			G08		A16 -2B	20		DAT IN
			6			G09		A17 2C	19		GND
			2			G10		A17 2A	19		DAT OUT
			6			G13		A18 2C	26		GND
			2			G12		A18 2A	26		HLD OUT
			6			J05		A18 2D	20		GND
			2			J04		A18 2B	20		MTR OUT
			6			J07		A16 -2C	20		GND
			2			J06		A16 -2A	20		REQ IN
			6			J10		A16 2C	34		GND
			2			J11		A16 2A	34		DIS IN
			6			J12		A18 2C	20		GND
			2			J13		A18 2A	20		OPL OUT
			6			J08					GND
		26	2	1000	J01	J09					SPARE

CONTROL DATA CORPORATION	CABLE TABS - CCC I/O, FIPS I/F METRIC	CODE IDENT	SHEET 4 of 9	A.	DOCUMENT NO. 67185231	REV. A

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS CHANNEL A BUS 0
		26	6	1000	J02	B02		A19 2C	40		GND
			2			B03		A19 -2A	40		BUS 0 OUT P
			6			B04		A19 -2D	41		GND
			2			B05		A19 -2B	41		BUS 0 OUT 1
			6			B07		A19 -2C	34		GND
			2			B08		A19 -2A	34		BUS 0 OUT 3
			6			B09		A19 -2D	28		GND
			2			B10		A19 -2B	28		BUS 0 OUT 5
			6			B13		A19 -2C	19		GND
			2			B12		A19 -2A	19		BUS 0 OUT 7
			6			D05		A19 -2C	42		GND
			2			D04		A19 -2A	42		BUS 0 OUT 0
			6			D07		A19 -2C	37		GND
			2			D06		A19 -2A	37		BUS 0 OUT 2
			6			D08		A19 -2C	28		GND
			2			D09		A19 -2A	28		BUS 0 OUT 4
			6			D10		A19 -2D	19		GND
			2			D11		A19 -2B	19		BUS 0 OUT 6
			6			D12		A17 -2C	28		GND
		26	2	1000	J02	D13		A17 -2A	28		MKO OUT

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CONTROL DATA CORPORATION	CABLE TABS - CCC I/O, FIPS I/F METRIC	CODE IDENT	SHEET 5 of 9	A.	DOCUMENT NO. 67185231	REV. B

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS CHANNEL A BUS O
		26	6	1000	J02	G02		A19 -1D	03		GND
			2			G03		A19 -1B	03		BUS O IN P
			6			G04		A19 -1C	03		GND
			2			G05		A19 -1A	03		BUS O IN 1
			6			G07		A19 -1C	08		GND
			2			G08		A19 -1A	08		BUS O IN 3
			6			G09		A19 1D	07		GND
			2			G10		A19 1B	07		BUS O IN 5
			6			G13		A19 -1C	04		GND
			2			G12		A19 -1A	04		BUS O IN 7
			6			J05		A19 -1D	05		GND
			2			J04		A19 -1B	05		BUS O IN O
			6			J07		A19 -1D	11		GND
			2			J06		A19 -1B	11		BUS O IN 2
			6			J08		A19 -1C	07		GND
			2			J09		A19 -1A	07		BUS O IN 4
			6			J10		A19 -1C	05		GND
			2			J11		A19 -1A	05		BUS O IN 6
			6			J12					GND
		26	2	1000	J02	J13					SPARE

CONTROL DATA CORPORATION	CABLE TABS - CCC I/O, FIPS I/F METRIC	CODE IDENT	SHEET 6 of 9	A	DOCUMENT NO. 67185231	REV. A

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS CHANNEL B TAG
		26	6	1000	J03	B02		B16 2D	29		GND
↑	↑	↑	2	↑	↑	B03	↑	B16 2B	29	↑	OPL IN
			6			B04		B16 2C	24		GND
			2			B05		B16 2A	24		ADR IN
			6			B07		B16 2D	19		GND
			2			B08		B16 2B	19		SEL IN
			6			B09		B18 2C	28		GND
			2			B10		B18 2A	28		ADR OUT
			6			B13		B18 2D	21		GND
			2			B12		B18 2B	21		SUP OUT
			6			D05		B16 2C	21		GND
			2			D04		B16 2A	21		STA IN
			6			D07		B16 1D	42		GND
			2			D06		B16 1B	42		SRV IN
			6			D08		B18 2C	22		GND
			2			D09		B18 2A	22		SEL OUT
			6			D10		B17 2C	22		GND
			2			D11		B17 2A	22		CMD OUT
↓	↓	↓	6	↓	↓	D12	↓	B17 2D	20	↓	GND
		26	2	1000	J03	D13		B17 2B	20		SRV OUT

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CONTROL DATA CORPORATION	CABLE TABS - CCC I/O, FIPS I/F METRIC	CODE IDENT	SHEET 7 of 9	A	DOCUMENT NO. 67185231	REV. B

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS CHANNEL B TAG
		26	6	1000	J03	G02		B17 2D	21		GND
↑	↑	↑	2	↑	↑	G03	↑	B17 2[illegible]	21	↑	CLK OUT
			6			G04		B16 1C	43		GND
			2			G05		B16 1A	43		MTR IN
			6			G07		B16 2D	20		GND
			2			G08		B16 2B	20		DAT IN
			6			G09		B17 2C	19		GND
			2			G10		B17 2A	19		DAT OUT
			6			G13		B18 2C	26		GND
			2			G12		B18 2A	26		HLD OUT
			6			J05		B18 2D	20		GND
			2			J04		B18 2B	20		MTR OUT
			6			J07		B16 2C	20		GND
			2			J06		B16 2A	20		REQ IN
			6			J10		B16 2C	34		GND
			2			J11		B16 2A	34		DIS IN
↓	↓	↓	6	↓		J12	↓	B18 2C	20	↓	GND
		26	2	1000		J13		B18 2A	20		OPL OUT
			6		↓	J08					GND
			2		J03	J09					SPARE

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CONTROL DATA CORPORATION	CABLE TABS - CCC I/O, FIPS I/F METRIC	CODE IDENT	SHEET 8 of 9	A	DOCUMENT NO. 67185231	REV. A

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS CHANNEL B BUS 0
		26	6	1000	J04	B02		B19 2C	40		GND
↑	↑	↑	2	↑	↑	B03	↑	B19 2A	40	↑	BUS 0 OUT P
			6			B04		B19 2D	41		GND
			2			B05		B19 2B	41		BUS 0 OUT 1
			6			B07		B19 2C	34		GND
			2			E08		B19 2A	34		BUS 0 OUT 3
			6			B09		B19 2D	28		GND
			2			B10		B19 2B	28		BUS 0 OUT 5
			6			B13		B19 2C	19		GND
			2			B12		B19 2A	19		BUS 0 OUT 7
			6			D05		B19 2C	42		GND
			2			D04		B19 2A	42		BUS 0 OUT 0
			6			D07		B19 2C	37		GND
			2			D06		B19 2A	37		BUS 0 OUT 2
			6			D08		B19 2C	28		GND
			2			D09		B19 2A	28		BUS 0 OUT 4
			6			D10		B19 2D	19		GND
			2			D11		B19 2B	19		BUS 0 OUT 6
↓	↓	↓	6	↓	↓	D12	↓	B17 2C	28	↓	GND
		26	2	1000	J04	D13		B17 2A	28		MKO OUT

AA3183 REV. 8/71

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60459180 AL

CONTROL DATA CORPORATION	CABLE TABS - I/O, FIPS I/F METRIC	CODE IDENT	SHEET 9 of 9	A	DOCUMENT NO. 67185231	REV. B

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) MM	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS CHANNEL A BUS O
		26	6	1000	J04	G02		B19 1D	03		GND
↑	↑	↑	2	↑	↑	G03	↑	B19 1B	03	↑	BUS O IN P
			6			G04		B19 1C	03		GND
			2			G05		B19 1A	03		BUS O IN 1
			6			G07		B19 1C	08		GND
			2			G08		B19 1A	08		BUS O IN 3
			6			G09		B19 1D	07		GND
			2			G10		B19 1B	07		BUS O IN 5
			6			G13		B19 1C	04		GND
			2			G12		B19 1A	04		BUS O IN 7
			6			J05		B19 1D	05		GND
			2			J04		B19 1B	05		BUS O IN O
			6			J07		B19 1D	11		GND
			2			J06		B19 1B	11		BUS O IN 2
			6			J08		B19 1C	07		GND
			2			J09		B19 1A	07		BUS O IN 4
			6			J10		B19 1C	05		GND
↓	↓	↓	2	↓	↓	J11	↓	B19 1A	05	↓	BUS O IN 6
		26	6	1000	J04	J12					GND
			2			J13					SPARE

AA3183 REV. 8/71 PRINTED IN U.S.A.

8-145/8-146

DWN	D.MICKELSON	6/14/84	CONTROL DATA ARHOPS CODE IDENT	TITLE CABLE TABS - CCC CYBER I/O	PREFIX A	DOCUMENT NO. 67185232	REV. B
CHKD	R. Haus'85	6/20/84					
ENG	N Horning	7/26/84		FIRST USED ON FR205-A		SHEET 1 OF 8	
MFG		7/-/84					
APPR	N Horning	7/26/84					

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SHEET REVISION STATUS

										8	7	6	5	4	3	2	1
															A	A	A
										B	B	B	B	B	A	A	B

REVISION RECORD

REV	ECO	DESCRIPTION	DRFT	DATE	APP
A		CLASS A DRAWING	D.M.	6/14/4	NH
B	CA46912	SEE C.O.		5-22-85	M.F.

NOTES:

DETACHED LISTS

AA3180 REV. 8/71 *79 CDC

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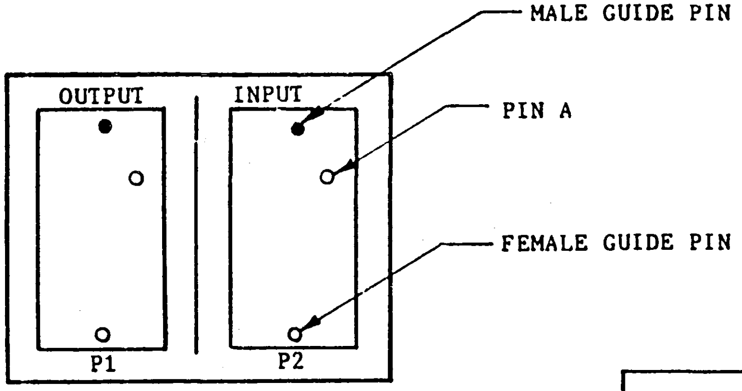
CONTROL DATA CORPORATION CABLE TABS-CCC CYBER I/O	CODE IDENT	SHEET 2	A	DOCUMENT NO. 67185232	REV. A



CONNECTOR BRACKET
BACK VIEW

CABLE PLACEMENT REFERENCE PIN (●) LOCATION		
	CHAN A	CHAN B
P1-J01	A01-2B18	B01-2B18
P1-J02	2B23	2B23
P1-J03	2B28	2B28
P1-J04	2B33	2B33
P1-J05	2B38	2B38
P2-J06	2A18	2A18
P2-J07	2A23	2A23
P2-J08	2A28	2A28
P2-J09	2A33	2A33
P2-J10	A01-2A38	B01-2A38

CONTROL DATA CORPORATION	CABLE TABS - CCC CYBER I/O	CODE IDENT	SHEET 3	A	DOCUMENT NO. 67185232	REV. A

OUTPUT CABLE P1

	GND C	SIGNAL B		
	○	●	PARITY	= P2-W
	○	○	JUMPER	
J01	○	○	MASTER CLEAR	= P2-V
	○	○	FUNCTION	= P2-U
	○	○	EMPTY	= P2-T
	○	●	JUMPER	
	○	○	FULL	= P2-S
J02	○	○	INACTIVE	= P2-R
	○	○	ACTIVE	= P2-P
	○	○	JUMPER	
	○	●	DATA 11	= P2-N
	○	○	DATA 10	= P2-M
J03	○	○	DATA 9	= P2-L
	○	○	JUMPER	
	○	○	DATA 8	= P2-K
	○	●	DATA 7	= P2-J
	○	○	DATA 6	= P2-H
J04	○	○	JUMPER	
	○	○	DATA 5	= P2-F
	○	○	DATA 4	= P2-E
	○	●	DATA 3	= P2-D
	○	○	JUMPER	
J05	○	○	DATA 2	= P2-C
	○	○	DATA 1	= P2-B
	○	○	DATA 0	= P2-A

INPUT CABLE P2

	SIGNAL A	GND D		
	●	○	PARITY	= P1-W
	○	○	JUMPER	
J06	○	○	1 MHZ CLOCK	= P1-V
	○	○	10 MHZ CLOCK	= P1-U
	○	○	EMPTY	= P1-T
	●	○	JUMPER	
	○	○	FULL	= P1-S
J07	○	○	INACTIVE	= P1-R
	○	○	ACTIVE	= P1-P
	○	○	JUMPER	
	●	○	DATA 11	= P1-N
	○	○	DATA 10	= P1-M
J08	○	○	DATA 9	= P1-L
	○	○	JUMPER	
	○	○	DATA 8	= P1-K
	●	○	DATA 7	= P1-J
	○	○	DATA 6	= P1-H
J09	○	○	JUMPER	
	○	○	DATA 5	= P1-F
	○	○	DATA 4	= P1-E
	●	○	DATA 3	= P1-D
	○	○	JUMPER	
J10	○	○	DATA 2	= P1-C
	○	○	DATA 1	= P1-B
	○	○	DATA 0	= P1-A

VIEWED FROM WIRE END
● =REFERENCE PIN

CONTROL DATA corporation	CABLE ASSEMBLY CYBER I/O	CODE IDENT	SHEET 4	WL	DOCUMENT NO. 67185232	REV. B

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) m	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS
	1	26	9	1.5	P1	A	2,3	J05	B5	5,12	OUTPUT DATA 2^0
			0			GND			C5		GND
			9		P1	B			B4		OUTPUT DATA 2^1
			0			GND			C4		GND
			9		P1	C			B3		OUTPUT DATA 2^2
			0			GND			C3		GND
			9		P1	D			B1		OUTPUT DATA 2^3
			0			GND		J05	C1		GND
			9		P1	E		J04	B5		OUTPUT DATA 2^4
			0			GND			C5		GND
			9		P1	F			B4		OUTPUT DATA 2^5
			0			GND			C4		GND
			9		P1	H			B2		OUTPUT DATA 2^6
			0			GND			C2		GND
			9		P1	J			B1		OUTPUTDATA 2^7
			0			GND		J04	C1		GND
			9		P1	K		J03	B5		OUTPUTDATA 2^8
			0			GND			C5		GND
			9		P1	L			B3		OUTPUTDATA 2^9
	1	26	0	1.5		GND	2,3	J03	C3	5,12	GND

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CONTROL DATA CORPORATION	CABLE ASSEMBLY CYBER I/O	CODE IDENT	SHEET 5	WL	DOCUMENT NO. 67185232	REV B

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) m	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS
	1	26	9	1.5	P1	M	2,3	J03	B2	5, 12	OUTPUT DATA 2^{10}
			0			GND			C2		GND
			9		P1	N			B1		OUTPUT DATA 2^{11}
			0			GND		J03	C1		GND
			9		P1	P		J02	B4		ACTIVE
			0			GND			C4		GND
			9		P1	R			B3		INACTIVE
			0			GND			C3		GND
			9		P1	S			B2		FULL
			0			GND		J02	C2		GND
			9		P1	T		J01	B5		EMPTY
			0			GND			C5		GND
			9		P1	U			B4		FUNCTION
			0			GND			C4		GND
			9		P1	V			B3		MASTER CLEAR
			0			GND			C3		GND
			9		P1	W			B1		OUTPUT PARITY
	1	26	0	1.5		GND	2,3	J01	C1	5,12	GND

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CONTROL DATA CORPORATION	CABLE ASSEMBLY CYBER I/O	CODE IDENT	SHEET 6.	W/L	DOCUMENT NO. 67185232	REV. B

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) m	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS
	1	26	9	1.5	P2	M	2,3	J08	A2	5,12	INPUT DATA 2^{10}
↑	↑	↑	0	↑		GND	↑	↑	D2	↑	GND
			9		P2	N		↓	A1		INPUT DATA 2^{11}
			0			GND		J08	D1		GND
			9		P2	P		J07	A4		ACTIVE
			0			GND		↑	D4		GND
			9		P2	R			A3		INACTIVE
			0			GND			D3		GND
			9		P2	S		↓	A2		FULL
			0			GND		J07	D2		GND
			9		P2	T		J06	A5		EMPTY
			0			GND		↑	D5		GND
			9		P2	U			A4		10 MHZ CLOCK
			0			GND			D4		GND
			9		P2	V			A3		1 MHZ CLOCK
			0			GND			D3		GND
↓	↓	↓	9	↓	P2	W	↓	↓	A1	↓	INPUT PARITY
	1	26	0	1.5		GND	2,3	J06	D1	5,12	GND

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CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) m	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS
	1	26	9	1.5	P2	A	2,3	J10	A5	5,12	INPUT DATA 2^0
↑	↑	↑	0	↑		GND	↑	↑	D5	↑	GND
			9		P2	B			A4		INPUT DATA 2^1
			0			GND			D4		GND
			9		P2	C			A3		INPUT DATA 2^2
			0			GND			D3		GND
			9		P2	D		↓	A1		INPUT DATA 2^3
			0			GND		J10	D1		GND
			9		P2	E		J09	A5		INPUT DATA 2^4
			0			GND		↑	D5		GND
			9		P2	F			A4		INPUT DATA 2^5
			0			GND			D4		GND
			9		P2	H			A2		INPUT DATA 2^6
			0			GND			D2		GND
			9		P2	J		↓	A1		INPUT DATA 2^7
			0			GND		J09	D1		GND
			9		P2	K		J08	A5		INPUT DATA 2^8
			0			GND		↑	D5		GND
↓	↓	↓	9	↓	P2	L	↓	↓	A3	↓	INPUT DATA 2^9
	1	26	0	1.5		GND	2,3	J08	D3	5,12	GND

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CONTROL DATA CORPORATION	CABLE ASSEMBLY CYBER I/O	CODE IDENT	SHEET 8	WL
DOCUMENT NO. 67185232	REV B			

CONDUCTOR IDENT.	FIND NO.	GAUGE (REF.)	COLOR (REF.)	LENGTH (APPROX) mm	ORIGIN		ACCESS FIND NO.	DESTINATION		ACCESS FIND NO.	REMARKS
	8	26	BLACK	40.0	J05	B2	5,12	J05	C2	5,12	JUMPER
↑	↑	↑	↑	↑	J04	B3	↑	J04	C3	↑	↑
					J03	B4		J03	C4		
					J02	B5		J02	C5		
					J02	B1		J02	C1		
					J01	B2		J01	C2		
					J10	A2		J10	D2		
					J09	A3		J09	D3		
					J08	A4		J08	D4		
					J07	A5		J07	D5		
↓	↓	↓	↓	↓	J07	A1	↓	J07	D1	↓	↓
	8	26	BLACK	40.0	J06	A2	5,12	J06	D2	5,12	JUMPER

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CYBER CHANNEL TRACE TABLES

A

The microcode for the CYBER channel side of the CYBER Channel Coupler (coupler) writes a four-word trace during all normal operations. Normal operations include CYBER function codes and Op codes received from the internal processor. Upon detection of an error, the trace is changed to eight words and the error code and three additional information words are written into the trace and are displayed on the maintenance panel of the coupler.

TRACE MEMORY LOCATIONS

The trace for the CYBER side resides in the coupler memory at locations 1E00$_{16}$ through 1EFF$_{16}$. These memory locations are used as follows:

Location$_{16}$	Content	Description
1E00	1E08	Starting Trace Address
1E01	00F0	Trace Length
1E02	XXXX	Next Trace Address
1E03	XXXX	Remaining Trace Length
1E04	0000	Microcode Revision
1E05	0000	Microcode Revision
1E06	0000	Microcode Revision
1E07	0000	Microcode Revision
1E08	XXXX	Trace
↓	↓	↓
1EFF	XXXX	Trace

TRACE FORMAT

The trace format is organized as follows. Note that the status word (word 3) indicates whether the trace is for a channel function or an Op code, and if an additional four words are added for an error trace.

Normal Trace

Channel Function			Op Code		
Word	**Description**	**Trace**	**Word**	**Description**	**Trace**
1	Channel Function	8XXX	1	Op Code	XXXX
2	Control Flags	XXXX	2	Address	XXXX
3	Trace Status	0000	3	Trace Status	4000
4	Status	00XX	4	Status	00XX

Error Trace

Channel Function			Op Code		
Word	**Description**	**Trace**	**Word**	**Description**	**Trace**
1	Channel Function	8XXX	1	Op Code	XXXX
2	Control Flags	XXXX	2	Address	XXXX
3	Trace Status	8000	3	Trace Status	C000
4	Status	00XX	4	Status	00XX

The trace words are defined as follows:

- Channel function: 12-bit CYBER function code same as location 0023_{16}.
- Control flags: Internal hardware status to microcode.

Bit	Description
00	Not Character Fill
01	Active or Pause
02	R2 Register Full
03	X1 Register Full
04	OP Code Altered
05	OK to Disconnect
06	Memory DB Register Full
07	Channel Parity Error
08	Memory Parity Error
09	Deadman Time-Out
10	Function
11	Microcode Master Clear
12	Length Equals Zero
13	DMA Complete
14	Processor Running
15	Processor Abnormal

- Trace Status

Bit	Description
0 or 1	Channel Function
0	Error Trace
1	Opcode Trace
2 - 15	Not Used

- Status: Status from memory location 0024_{16}.

Bit	Description
0	Not Used
1	Not Used
2	Interaction Quicklook Complete
3	CYBER Quicklook Complete
4	Not Used
5	Not Used
6	Not Used
7	Not Used
8	Normal End
9	Channel Parity Error
10	Memory Parity Error
11	Deadman Timeout
12	Control Package Memory Parity Error
13	Transfer Indicator
14	Character Fill
15	Not Used

- Op Code: This is the Op-code command read from location 0020_{16}.
- Address: This is the address read from location 0021_{16}.

- Error Code: See tables A-1 and A-2 for a list of error codes. Note that the error codes are output to the coupler maintenance panel for display.
- Info. 1
- Info. 2 — Varies with error code. See table A-1 and A-2.
- Info. 3

Table A-1. Error Codes/Normal Operations

Hexadecimal Error Code	Info. 1	Info. 2	Info. 3	Status	Misc.	Description
1101	DB REG	ADRS REG	LEN REG	0020	DB REG word with parity error	Memory parity error
1102	DB REG	ADRS REG	LEN REG	0008	DB REG word with parity error	Control package memory parity error
1103	DB REG	ADRS REG	LEN REG	0000	DB REG word with parity error	Trace length is 0
1104	R REG	ADRS REG	LEN REG	0040	DB REG word with parity error	Channel parity error
1105	R REG	ADRS REG	LEN REG	0010	DB REG word with parity error	Deadman timeout
1106	DB REG	ADRS REG	LEN REG	0000	DB REG word with parity error	Trace length is 0 at location 1E01
1107	R REG	ADRS REG	LEN REG	0040	DB REG word with parity error	Channel FCN, parity error

Table A-2. Quicklook Errors (Sheet 1 of 2)

Hexadecimal Error Code	Info. 1	Info. 2	Info. 3	Status	Misc.	Description
1301	DB REG	ADRS REG	LEN REG	0000	Section 0	Length not 0
1302	DB REG	ADRS REG	LEN REG	0000	Section 0	Length is 0
1303	DB REG	ADRS REG	LEN REG	0000	Section 0	Length not 0
1304	DB REG	ADRS REG	LEN REG	0000	Section 0	Length is 0
1305	DB REG	ADRS REG	LEN REG	0000	Section 0	Length not 0
1306	DB REG	ADRS REG	LEN REG	0000	Section 0	Length is 0
1307	DB REG	ADRS REG	LEN REG	0000	Section 0	Length is 0
1308	DB REG	ADRS REG	LEN REG	0000	Section 0	Length not 0
1309	DB REG	ADRS REG	LEN REG	0000	Section 0	Length is 0
1310	DB REG	ADRS REG	LEN REG	0000	Section 0	Length not 0
1311	DB REG	ADRS REG	LEN REG	0000	Section 1	Length is 0
1312	DB REG	ADRS REG	LEN REG	0000	Section 1	Length not 0
1321	DB REG	ADRS REG	LEN REG	0000	Section 2	First Pop instruction failed
1322	DB REG	ADRS REG	LEN REG	0000	Section 2	Second Pop instruction failed
1323	DB REG	ADRS REG	LEN REG	0000	Section 2	Third Pop instruction failed
1323	DB REG	ADRS REG	LEN REG	0000	Section 2	Fourth Pop instruction failed
1325	DB REG	ADRS REG	LEN REG	0000	Section 2	Length not 0
1331	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI bit test failed
1332	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI shift 4 failed
1333	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI shift 8 failed
1334	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI shift 12 failed
1334	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI bits 12 - 15 PROM data and bit test
1336	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI SH = 4 PROM data and bit test

Table A-2. Quicklook Errors (Sheet 2 of 2)

Hexadecimal Error Code	Info. 1	Info. 2	Info. 3	Status	Misc.	Description
1337	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI SH = 8 PROM data and bit test
1338	DB REG	ADRS REG	LEN REG	0000	Section 3	UDI SH = 12 PROM data and bit test
1341	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 1110
1342	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 1101
1343	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 1011
1344	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 0111
1345	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 0001
1346	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 0010
1347	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 0100
1348	DB REG	ADRS REG	LEN REG	0000	Section 4	UDI check A/D clock 1000
1351	DB REG	ADRS REG	LEN REG	0000	Section 5	UDI check bit set/ clear, bits 12 - 15
1352	DB REG	ADRS REG	LEN REG	0000	Section 5	UDI check bit set/ clear, bits 8 - 15
1361	DB REG	ADRS REG	LEN REG	0000	Section 6	UDI check register file
1371	DB REG	ADRS REG	LEN REG	0008	Interaction quicklook	Control package memory parity error
1372	DB REG	ADRS REG	LEN REG	0020	Interaction quicklook	Memory parity error
1373	DB REG	ADRS REG	LEN REG	0000	Interaction quicklook	Length not 0 after memory read to register file and register file read to memory write

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